



Installation and Operation Manual

RPI M50A_120
RPI M50A_122

This manual applies for solar inverter models:

- **RPI M50A_120 (with string fuses and surge protection devices)**
- **RPI M50A_122 (with string fuses only)**

with firmware version:

DSP: 1.31 / RED: 1.12 / COM: 98.26

The latest version of this manual is available at
www.solar-inverter.com.

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This manual is included with our solar inverter and is intended for use by the installer and end user.

The technical instructions and illustrations in this manual are to be treated as confidential and no part of this manual may be reproduced without prior written permission from Delta Energy Systems. Maintenance technicians and end users may not release the information contained in this manual, and may not use it for purposes not directly associated with the proper use of the solar power inverter.

All information and specifications can be modified without prior notice.

Table of Contents

Table of Contents

1. About this manual	5
1.1 Purpose of this manual	5
1.2 Target audience of this manual	5
1.3 Warnings and symbols	5
1.4 Conventions used in this manual	6
2. General safety instructions	7
3. Intended use.	8
4. Product overview	10
4.1 Scope of delivery.	10
4.2 Components and connectors	11
4.3 Display, buttons, status LEDs	12
4.4 String fuses	12
4.5 Surge protection devices.	13
4.5.1 AC side.	13
4.5.2 AC side.	13
4.6 Air inlets and fans	13
4.7 Electrical connectors.	14
4.7.1 Overview	14
4.7.2 AC/DC disconnection switch.	15
4.7.3 AC connector (AC output)	15
4.7.4 DC connectors (DC inputs)	15
4.7.5 Communication port 1	15
4.7.6 Communication port 2	16
4.7.7 Grounding connection	16
4.8 Information on the type label.	17
5. Planning the installation	18
5.1 Where to mount the solar inverter	18
5.2 Outdoor installations	19
5.3 Ambient conditions and air circulation	19
5.4 Temperature derating curves.	20
5.5 Efficiency curve	23
5.6 Dimensions.	24
5.7 AC connection	25
5.8 DC connection	26
5.8.1 Symmetrical and asymmetrical power input	26
5.8.2 Use with solar modules that do not need to be grounded.	27
5.8.3 Use with solar modules that have to be grounded.	28
5.8.4 Using DC1 and DC2 with only one MPP tracker	31
5.9 Connecting to a datalogger via RS485.	32
5.10 Circuit diagram of string fuses and SPDs	33
5.11 What you need.	34
6. Installation.	37
6.1 Safety instructions	37
6.2 Mounting the inverter.	38
6.3 Grounding the inverter housing	39
6.4 Connecting to the grid (AC)	40
6.5 Connecting to the solar modules (DC).	42
6.5.1 Safety instructions	42
6.5.2 Cable specification	42
6.6 Using DC1 and DC2 with only one MPP tracker (optional)	43
6.7 Connecting communication port I (optional)	45
6.7.1 RS485 and VCC	45

Table of Contents

6.7.2	Dry contacts	47
6.7.3	Digital inputs and EPO	47
6.8	Wiring communication port 1	48
6.8.1	First steps for all cables	48
6.8.2	Wiring a single inverter for RS 485	48
6.8.3	Wiring multiple inverters for RS 485	49
6.8.4	Wiring the dry contacts	50
6.8.5	Wiring the digital inputs	50
6.8.6	Finishing the wiring	50
6.9	Putting labels on the inverter	51
7.	Commissioning	52
8.	Settings	53
8.1	Overview	53
8.2	Current grid settings (inverter information)	54
8.3	Display language	55
8.4	Date and time	56
8.5	Baud rate for RS485	57
8.6	Inverter ID	58
8.7	Insulation mode and insulation resistance	59
8.8	Grid settings	61
8.8.1	Overview	61
8.8.2	Voltage protection	61
8.8.3	Frequency protection	63
8.8.4	Reconnection time	65
8.8.5	P Ramp Up	66
8.9	EPO (External Power Off)	67
8.10	AC Connection type	68
8.11	Max. Power (Maximum feed-in power)	69
8.12	Power limitation	70
8.13	Power versus frequency	72
8.14	Constant cos phi	74
8.15	Cos phi (P)	76
8.16	Constant Q	78
8.17	Q (V) - Apparent power versus voltage	80
8.18	FRT (Fault Ride Through)	83
9.	Measurements and statistics	85
9.1	Meter	85
9.2	Energy log	87
9.3	Event log	88
9.4	Inverter information	89
10.	Error messages and trouble shooting	90
10.1	Errors	90
10.2	Warnings	91
10.3	Faults	91
11.	Maintenance	95
11.1	Regular maintenance	95
11.2	Replacing the fans	96
11.3	Cleaning the fans	97
11.4	Cleaning the air filters	98
11.5	Replacing surge protection devices (SPD) on the DC side	99
11.6	Replacing surge protection devices (SPD) on the AC side	100
11.7	Replacing string fuses	102
12.	Decommissioning	103
13.	Technical data	105

1. About this manual

1.1 Purpose of this manual

This manual is part of the inverter and will help you become familiar with the inverter.

Always follow the safety instructions given in this manual. You can help keep the product durable and reliable during its use by handling it carefully.

Read the manual carefully and thoroughly and follow the instructions contained therein. This manual contains important information on the installation, commissioning and operation of the solar inverter.

Always follow the general safety instructions (see “[2 General safety instructions](#)”, p. [7](#)).

Store the manual in a safe place near the inverter, so that installer and operator have easy access to this manual.

The solar inverter can be safely and normally operated if installed and used in accordance with this manual. Delta Energy Systems is not responsible for damage incurred by failure to comply with the installation and operating instructions in this manual.

1.2 Target audience of this manual

This manual is aimed at qualified electricians who have received a sufficient training to apply safe methods of work to install a micro-generator in compliance with the requirements of the applying standard.

Only chapter “[9 Measurements and statistics](#)”, p. [85](#) is relevant to the operator. All other activities may only be performed by qualified electricians.

1.3 Warnings and symbols

Where hazards may arise when working with the solar inverter, the following hazard levels and symbols are used to indicate these hazards:

DANGER

DANGER indicates a hazardous situation which, if not avoided, **will** result in death or serious injury.

WARNING

WARNING indicates a hazardous situation which, if not avoided, **could** result in death or serious injury.

CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could** result in minor or moderate injury.

NOTICE

ATTENTION is used to address practices not related to physical injury.



A note provides general information on using the solar inverter. A note does **not** indicate hazardous situations.

Where required, further, supplementary warning symbols are used. Type and source of the hazard is explained in the safety instructions or warnings.



This symbol is a warning of a risk of electric shock due to high voltage.



The symbol is a warning of a hot surface.



This symbol is a warning of general hazards.

1. About this manual

1.4 Conventions used in this manual

Order of instructions

Numbered instructions must be performed in the specified order.

1. First instruction step

→ When the solar inverter reacts to a step, this reaction is marked with an arrow.

2. Second instruction step

3. Third instruction step

Instructions consisting of only one step or when the order of the instruction steps is not important, are shown as follows:

- ▶ Instruction step
- ▶ Instruction step

Device buttons and LEDs

Device buttons and LEDs are shown in this manual as follows:

Buttons on the solar inverter:  button.

LEDs on solar inverter: **ALARM** LED

LED symbol	Meaning
	LED stays on.
	LED flashes.
	LED is off.

Information on Display

Information shown on the solar inverter display includes menus, settings and messages.

This information is shown in this manual as follows:

Menu names: **User settings** menu

Parameter names: **Cos phi** parameter.

2. General safety instructions

2. General safety instructions

DANGER



High electrocution

Potentially fatal voltage is applied to the solar inverter during operation. This potentially fatal voltage is still present for 10 seconds after all power sources have been disconnected.

- ▶ Always disconnect the inverter from power before installation, open the AC/DC isolating switch and make sure neither can be accidentally reconnected.
- ▶ Only the cover from the fuse section may be removed. Never open other parts of the inverter.
- ▶ Wait at least 10 seconds until the capacitors have discharged.

DANGER



High electrocution

Potentially fatal voltage may be applied to the DC connections of the solar inverter. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining.

- ▶ Never disconnect the solar modules when the solar inverter is powered.
- ▶ First switch off the grid connection so that the solar inverter cannot feed energy into the grid.
- ▶ Turn the AC/DC isolating switch to position **OFF**.
- ▶ Make sure the DC connections cannot be accidentally touched.

WARNING



High electrocution

When you remove the cover from the fuse section, protection degree is no longer IP65.

- ▶ Remove the cover only when it is really necessary.
- ▶ Do not remove the cover when it is raining and the inverter is wet.
- ▶ Close the cover tightly after work.

- The solar inverter can be safely and normally operated if installed and used in accordance with this manual (see IEC 62109-5.3.3). Delta Energy Systems is not responsible for damage incurred by failure to observe the installation and operating instructions in this manual. For this reason, be sure to observe and follow all instructions!
- Installation and commissioning may only be performed by qualified electricians using the installation and commissioning instructions found in this manual.
- The solar inverter must be disconnected from power and the solar modules before any work on it can be performed.
- The solar inverter has a high leakage current value. The ground wire **must** be connected before commissioning.
- Do not remove any warning signs that the manufacturer has installed on the solar inverter.
- Improper handling of the solar inverter may result in physical injury and damage to property. For this reason, observe and follow all general safety instructions and warnings.
- The solar inverter contains no components that must be maintained or repaired by the operator or installer. All repairs must be performed by Delta Energy Systems. Opening the cover will void the warranty.
- Do not disconnect any cables when the solar inverter is powered due to risk of a fault arc.
- To prevent lightning strikes, follow the relevant regulations applicable in your country.
- The surface of the solar inverter can become very hot during operation. Use safety gloves when working on the solar inverter.
- The solar inverter is very heavy. The solar inverter must be lifted and carried by at least three people.
- Only devices in compliance with SELV (EN 69050) may be connected to the RS485 and USB interfaces.
- All connections must be sufficiently insulated in order to comply with the IP65 protection rating. Unused connections must be closed by placing cover caps on the solar inverter.

3. Intended use

3. Intended use

The solar inverter may only be used as intended.

Proper use of the solar inverter meets the following criteria:

- Use in stationary PV systems connected to the local power grid for converting the direct current in the PV system to alternating current and feeding it into the grid
- Use within the specified power range (see "[13 Technical data](#)", p. [105](#)) and under the specified ambient conditions (see "[5 Planning the installation](#)", p. [18](#)).

Any of the following uses of the solar inverter is considered improper:

- Isolated operation. The solar inverter has anti-islanding and other monitoring features.
- Use in mobile PV systems.



EC Declaration of Conformity

Producer: Delta Energy Systems (Germany) GmbH
Address: Tscheulinstr. 21, 79331 Teningen, Germany

Product Description: Solar Inverter for Grid operation

Model: RPI M50A_xxx (x=0-9, a-t or blank)

The product described above in the form as delivered is in conformity with the provisions of the following European Directives:

2004/108/EC Council Directive on the approximation of the laws of the Member States relating to electromagnetic compatibility
EN 61000-6-3:2007 / EN 61000-6-4:2007
EN 61000-3-11:2001 / EN 61000-3-12:2005
EN 61000-6-2:2005 / EN 61000-6-1:2007
IEC 61000-4-2:2008 / IEC 61000-4-3:2010
IEC 61000-4-4:2011 / IEC 61000-4-5:2005
IEC 61000-4-6:2008
IEC 61000-4-8:2009
IEC 61000-4-11:2004

2006/95/EC Council Directive on the approximation of the laws of the Member States related to electrical equipment designed for use within certain voltage limits
IEC 62109-1:2010, IEC 62109-2:2011

Teningen, Oct 15th 2014

Patrick Schahl

Product Management
LOB SPE

Name, Function

A handwritten signature in blue ink, appearing to read "P.Schahl". It is positioned over a dashed horizontal line.

Signature

Andreas Hoischen

Head of LOB
SPE

Name, Function

A handwritten signature in blue ink, appearing to read "A.Hoischen". It is positioned over a dashed horizontal line.

Signature

This declaration certifies the conformity to the specified directives but contains no assurance of properties. The safety documentation accompanying the product shall be considered in detail.

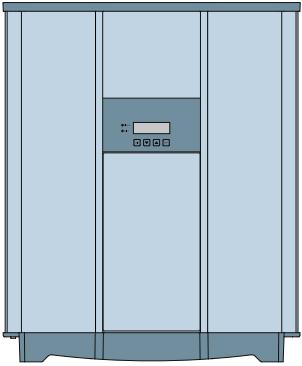
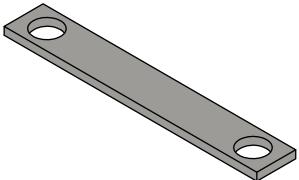
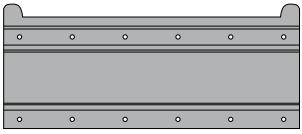
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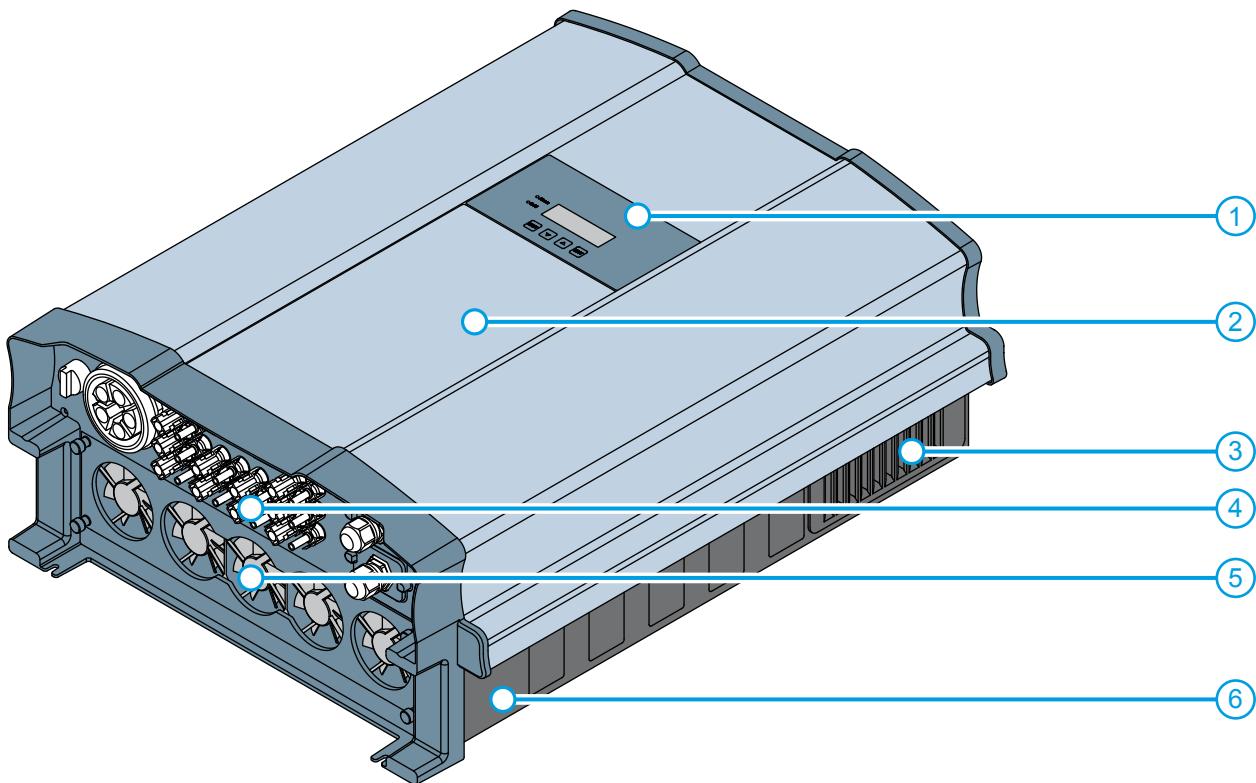
4. Product overview

4. Product overview

4.1 Scope of delivery

Part	Qty	Image/Description	Part	Qty	Image/Description
Inverter	1	 A vertical rectangular inverter unit with a blue and grey design. It has a central control panel with several small buttons and a digital display.	DC bus bar	2	Used when the solar modules have to be grounded and for connecting the two DC inputs to one MPP tracker.  A long, thin, grey metal bar with two circular holes at each end, used for connecting DC inputs.
Mounting plate	1	 A horizontal metal plate with multiple circular mounting holes along its length, used for mounting the inverter.	DC Fuse holder	1	Used when the solar modules have to be grounded.  A black plastic component designed to hold a fuse, used for grounding the solar modules.
AC plug	1	China Aviation Optical-Electrical Technology Co. PVE5T125KE36  A black cylindrical AC power plug with multiple pins, used for connecting the inverter to a power source.	Screw for grounding the inverter housing	1	An appropriate screw with washer, washer spring and toothed ring is already mounted to the inverter
DC plugs	10	Multi-Contact MC4 plug for DC+ (32.0017P0001-UR for 4/6 mm ²)  A dark grey cylindrical DC plug with four contacts, used for connecting the positive DC input.	Quick Installation Guide and General Safety Instructions	1	 Installation and Operation Manual RPI M50A 
	10	Multi-Contact MC4 plug for DC- (32.0016P0001-UR for 4/6 mm ²)  A dark grey cylindrical DC plug with four contacts, used for connecting the negative DC input.			

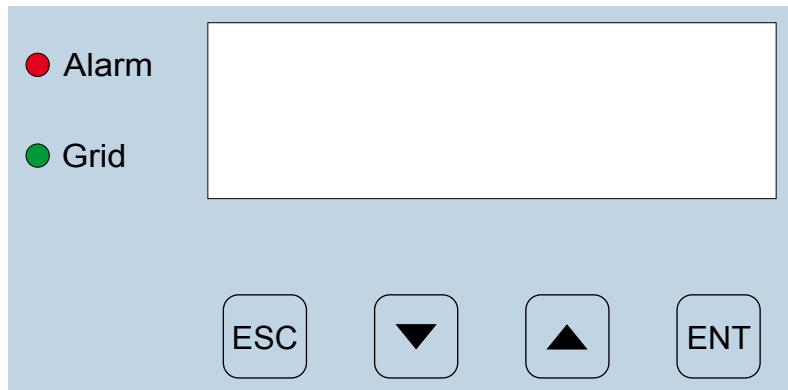
4.2 Components and connectors



No.	Component / connector	Description
①	Display, buttons, status LEDs	See “4.3 Display, buttons, status LEDs”, p. 12
②	String fuses and AC/DC overvoltage protection	See “4.4 String fuses and AC/DC surge protection device”, p. 12
③	Air inlets	See “4.5 Air inlets and fans”, p. 13
④	Electrical connectors	See “4.6 Electrical connectors”, p. 14
⑤	Fans	See “4.5 Air inlets and fans”, p. 13
⑥	Type label	See “4.7 Information on the type label”, p. 17

4. Product overview

4.3 Display, buttons, status LEDs



Label	Designation	Usage
LEDs		
<i>GRID</i>	Grid	Green; lights up when the inverter feeds into the grid
<i>ALARM</i>	Alarm	Red; indicates an error, fault, or warning
Buttons		
	Escape	Exit current menu. Cancel value setting.
	Move down	Move downwards in menu. Set value (decrease).
	Move up	Move upwards in menu. Set a value (increase).
	Enter	Select menu item. Open configurable value for editing. Finish editing (adopt set value).

4.4 String fuses

The RPI M50A is equipped with string fuses on the DC side.



Type

Manufacturer	Littelfuse
Part number	0SPF015.T
Rate current	15 A
Rate voltage	1000 V
or	
Manufacturer	Hollyland
Part number	10GPV15UO
Rate current	15 A
Rate voltage	1000 V

4.5 Surge protection devices

4.5.1 AC side

The M50A_120 additionally has surge protection devices type 2 on the AC and the DC side.



Type

Manufacturer	GEHE
Part number	GPU1-C40/690
Voltage U_C	690 V _{AC}
Current I_n	15 kA (8/20)
Current I_{max}	30 kA (8/20)
Voltage U_P	≤ 2.5 kV

4.5.2 AC side

The M50A_120 additionally has surge protection devices type 2 on the AC and the DC side.



Type

Manufacturer	GEHE
Part number	GPU1-ZS1000*
Voltage U_C	1120 V _{DC}
Current I_n	20 kA (8/20)
Current I_{max}	40 kA (8/20)
Voltage U_P	≤ 3.9 kV

4.6 Air inlets and fans

Air is intaken from the environment through the *air inlets* on the upper left and upper right side of the inverter. The air is used to cool the inverter. The warmed-up air is ejected at the *fans* on the bottom side of the inverter.

For a detailed description of the cooling principle, see "[5.3 Ambient conditions and air circulation](#)", p. 19.

For a detailed description how to clean or replace the fans, see "[11. Maintenance](#)", p. 95.

4. Product overview

4.7 Electrical connectors

4.7.1 Overview

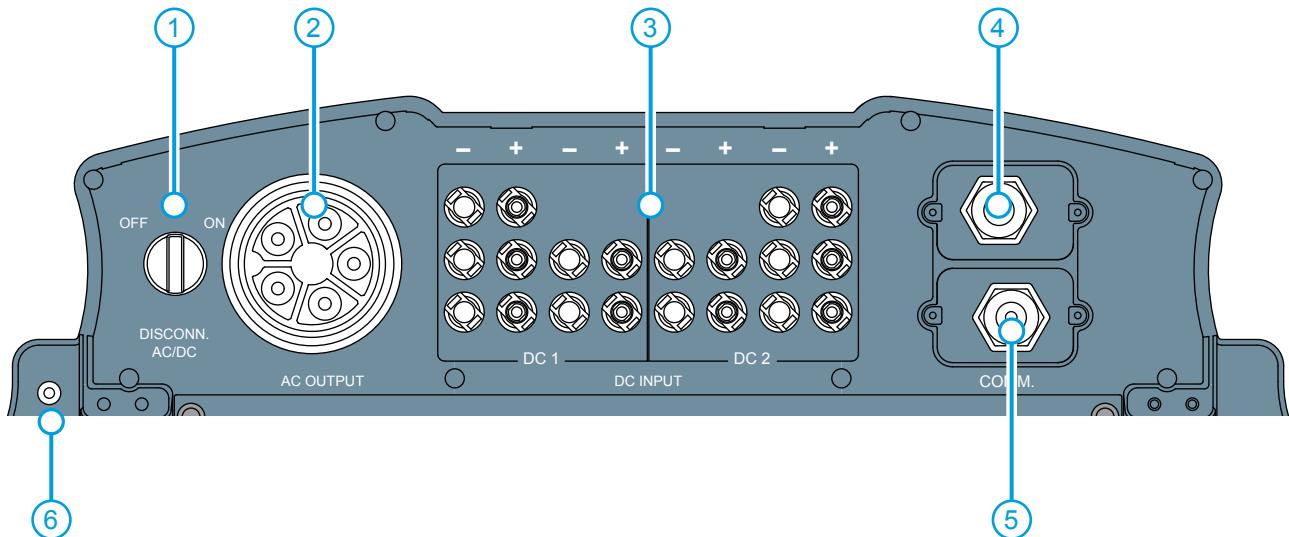


Fig. 4.1: Overview electrical connectors

No.	Component / connector	Description
①	AC/DC disconnection switch	See "4.6.2 AC/DC disconnection switch", p. 15
②	AC connector (AC output)	See "4.6.3 AC connector (AC output)", p. 15
③	DC connectors (DC inputs)	See "4.6.4 DC connectors (DC inputs)", p. 15
④	Communication port 1	See "4.6.5 Communication port 1", p. 15
⑤	Communication port 2	See "4.6.6 Communication port 2", p. 16
⑥	Grounding screw	See "4.6.7 Grounding connection", p. 16

4.7.2 AC/DC disconnection switch

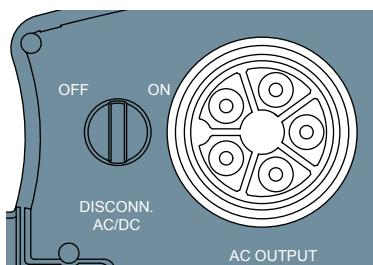


The inverter is **disconnected** from the grid (AC) and the solar modules (DC) when the *AC/DC disconnection switch* is in position **OFF**.



The inverter is **connected** to the grid (AC) and the solar modules (DC) when the *AC/DC disconnection switch* is in position **ON**.

4.7.3 AC connector (AC output)



The **AC connector** is used for connecting the inverter to the grid.

Usage of the AC connection:

- Feeding AC current into the grid.
- Powering up the display when no DC voltage is available via the *DC connectors (DC inputs)*.

The inverter can be connected to:

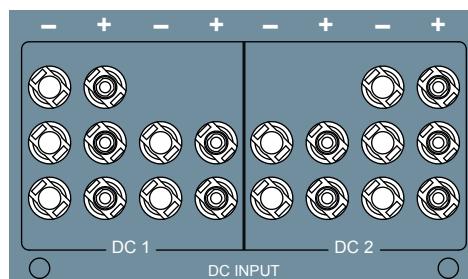
- 5-wire grid systems 3P4W (L1, L2, L3, N, PE)
- 4-wire grid systems 3P3W (L1, L2, L3, PE).

AC plug type:

China Aviation Optical-Electrical Technology Co.
PVE5T125KE36

The AC plug is delivered with the inverter.

4.7.4 DC connectors (DC inputs)



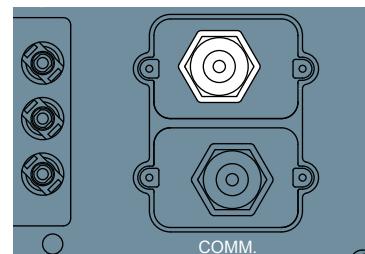
The *DC connectors (DC inputs)* are used for connecting inverter to the solar module string(s).

Connector type:

- Multi-contact MC4
- 10 pairs with female socket for DC+ and male socket for DC-.
- 10 pairs of plugs are delivered with the inverter

For technical specifications, see "[13. Technical data](#)", p. [105](#).

4.7.5 Communication port 1



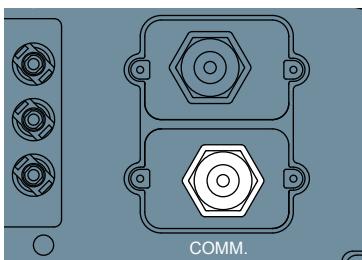
Functions of *Communication port 1*:

- 1 x RS485 in/out (e.g. for connecting to a datalogger)
- 6 x Digital inputs (e.g. for connecting to a ripple receive controller)
- 2 x Dry contacts (e.g. for connecting to an external relais)
- 1 x VCC contacts (e.g. for connecting to an external relais)

For a detailed description, see "[6.7 Connecting communication port 1 \(optional\)](#)", p. [45](#).

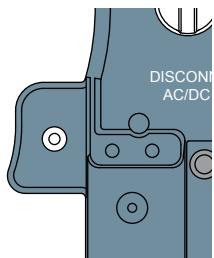
4. Product overview

4.7.6 Communication port 2



Communication port 2 is not available on this inverter.

4.7.7 Grounding connection



The *grounding connection* is used for grounding the housing of the inverter.

The grounding screw (M6) with washer spring, washer and toothed ring is already mounted to the inverter.

For a detailed description, see "[6.3 Grounding the inverter housing](#)", p. 39.

4.8 Information on the type label

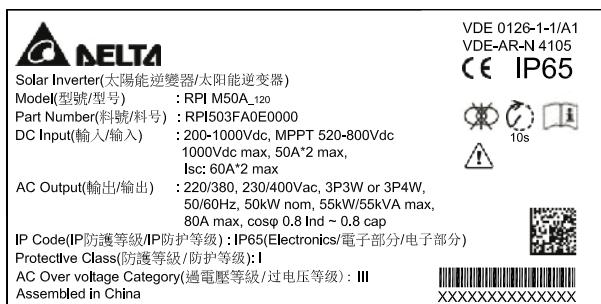


Fig. 4.2: RPI M50A_120 type label

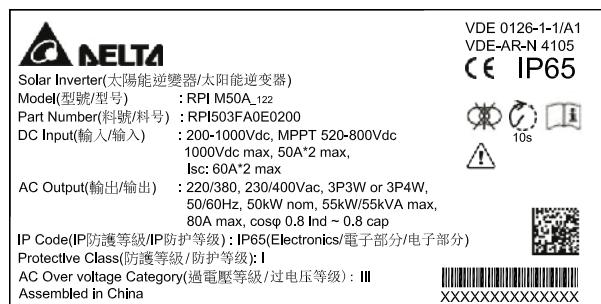


Fig. 4.3: RPI M50A_122 type label

Information on type label	Description
	This inverter has no transformer.
	Risk of death by electrocution Potentially fatal voltage is present when the inverter is in operation that remains for 10 seconds after being disconnected from power.
	Never open the inverter. The inverter contains no components that must be maintained or repaired by the operator or installer. Opening the cover will void the warranty.
	Read the manual delivered with the inverter before working with the inverter and follow the instructions contained in the manual.
	The housing of the inverter must be grounded if this is required by local regulations.
DC Input	
200-1000Vdc	DC input voltage range
MPPT 520-800Vdc	MPP input voltage range with full power (with symmetrical load)
1000Vdc	Maximum DC input voltage
50A*2 max.	Maximum DC input current per DC input (50 A for each DC input)
Isc: 60A*2 max.	DC short circuit current
AC Output	
220/380, 230/400 Vac	AC Nominal voltage
3P3W or 3P4W	The inverter can be connected to 3-wire systems (3 phases + PE) and 4-wire systems (3 phases + N + PE)
50/60 Hz	AC Nominal frequency
50kW nom.	Nominal active power
55kW/55kVA	Maximum active/reactive power
80A max.	Maximum AC current
cos φ 0.8 ind ~ 0.8 cap	Range of cos φ
IP Code: IP65 (Electronics)	Protection degree for the electronics according to EN 60529
Protective Class: I	Safety class according to EN 61140
AC Over voltage category: III	AC overvoltage category according to IEC 62109-1

5 Planning the installation

5. Planning the installation

NOTE



This chapter is for planning the installation only and is not related to do any real actions.

Some of the actions can be dangerous. Chapter “6. Installation”, p. 37 describes all actions and the possibly related risks in detail.

5.1 Where to mount the solar inverter

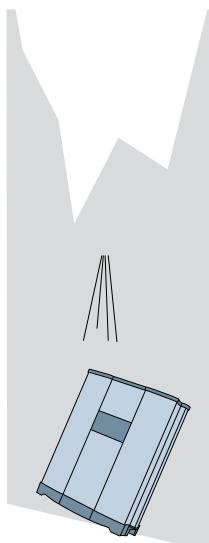


Fig. 5.1: Where to mount the inverter 1

- ▶ The solar inverter is very heavy. The solar inverter must be lifted and carried by at least three people.
- ▶ Always use the mounting plate supplied with the solar inverter.
- ▶ Check that the wall is capable of bearing the heavy load of the device.
- ▶ Use dowels and screws that are suitable for the wall material and the heavy weight.
- ▶ Mount the solar inverter on a vibration-free wall to avoid disruptive vibrations.
- ▶ Possible noise emissions can be disruptive when the device is used in living areas or in buildings with animals. Therefore, choose your installation location carefully.

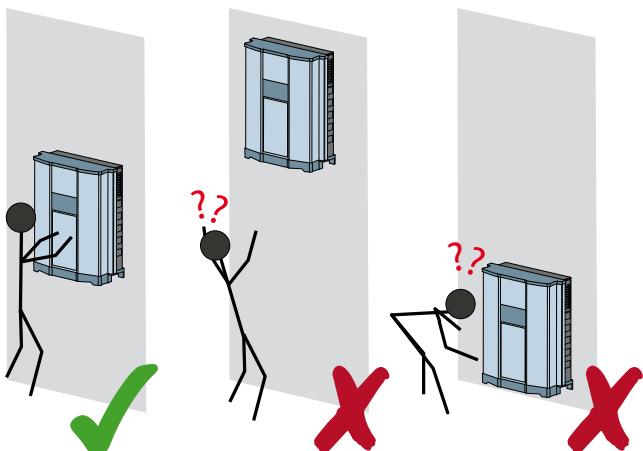


Fig. 5.2: Where to mount the inverter 2

- ▶ Mount the solar inverter so that the LEDs and display can be easily seen and that the buttons can be operated. Make sure the reading angle and installation height are sufficient.



Fig. 5.3: Mounting orientation

- ▶ Mount the solar inverter vertically.

5.2 Outdoor installations

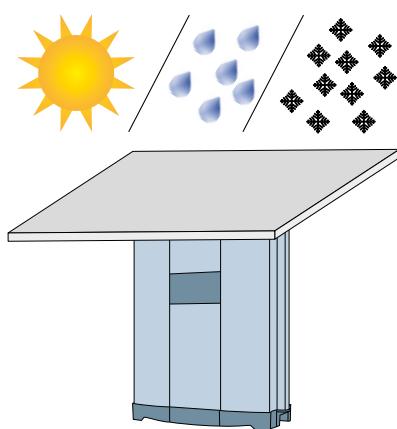


Fig. 5.4: Outdoor installations

- ▶ The solar inverter has protection degree IP65 and can be installed indoors or in protected outdoor areas (that means outdoor but protected by a roof against direct sun, rain or snow).

5.3 Ambient conditions and air circulation

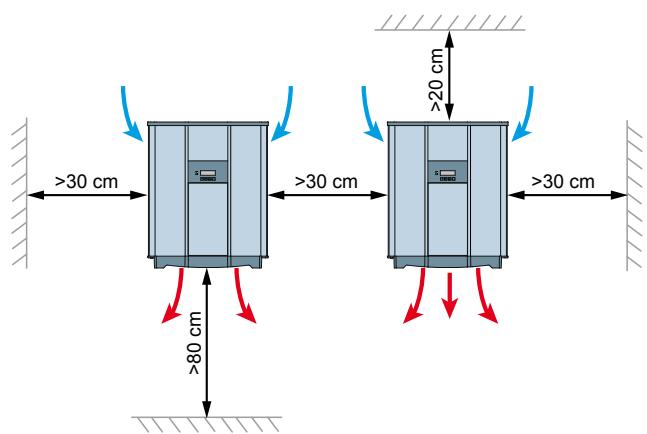


Fig. 5.5: Mounting distances and air circulation

- ▶ Ensure adequate air circulation. Hot air must be able to dissipate downward. Keep enough space around each inverter.
- ▶ Do not install inverters directly above one another. Otherwise, the lower inverter is warmed up by the upper one.
- ▶ Consider the **operating temperature range** (see “13. Technical data”, p. 105).

When the operating temperature range is exceeded, the solar inverter reduces the amount of power generated.

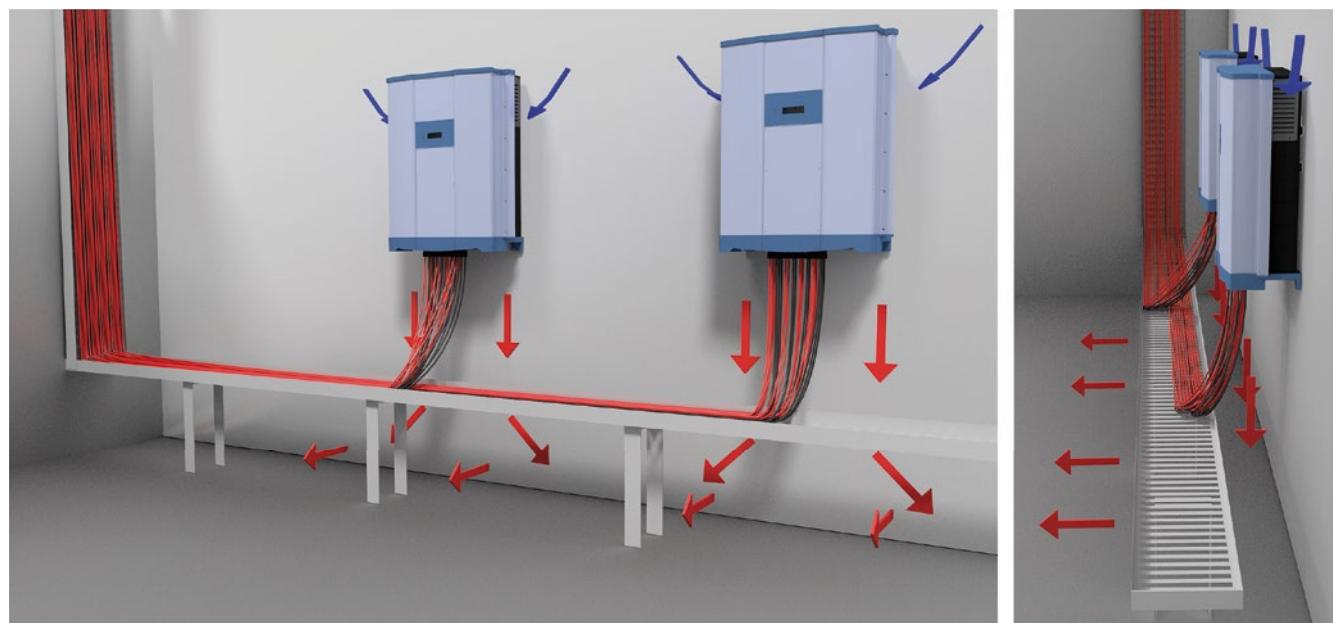


Fig. 5.21: Air flow around solar inverter

5 Planning the installation

5.4 Temperature derating curves

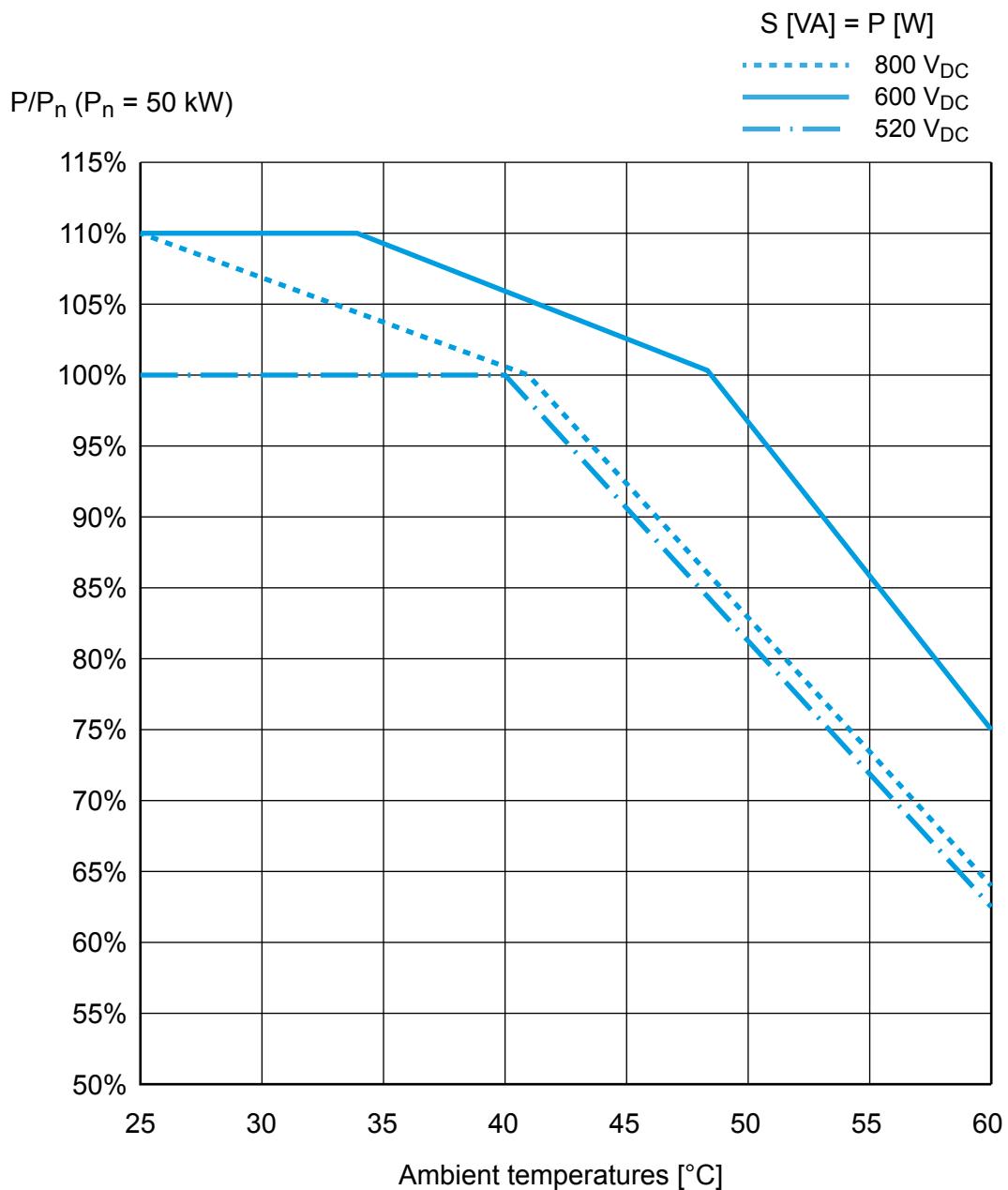


Fig. 5.6: Temperature derating curve ($\cos \varphi = 1.0$)

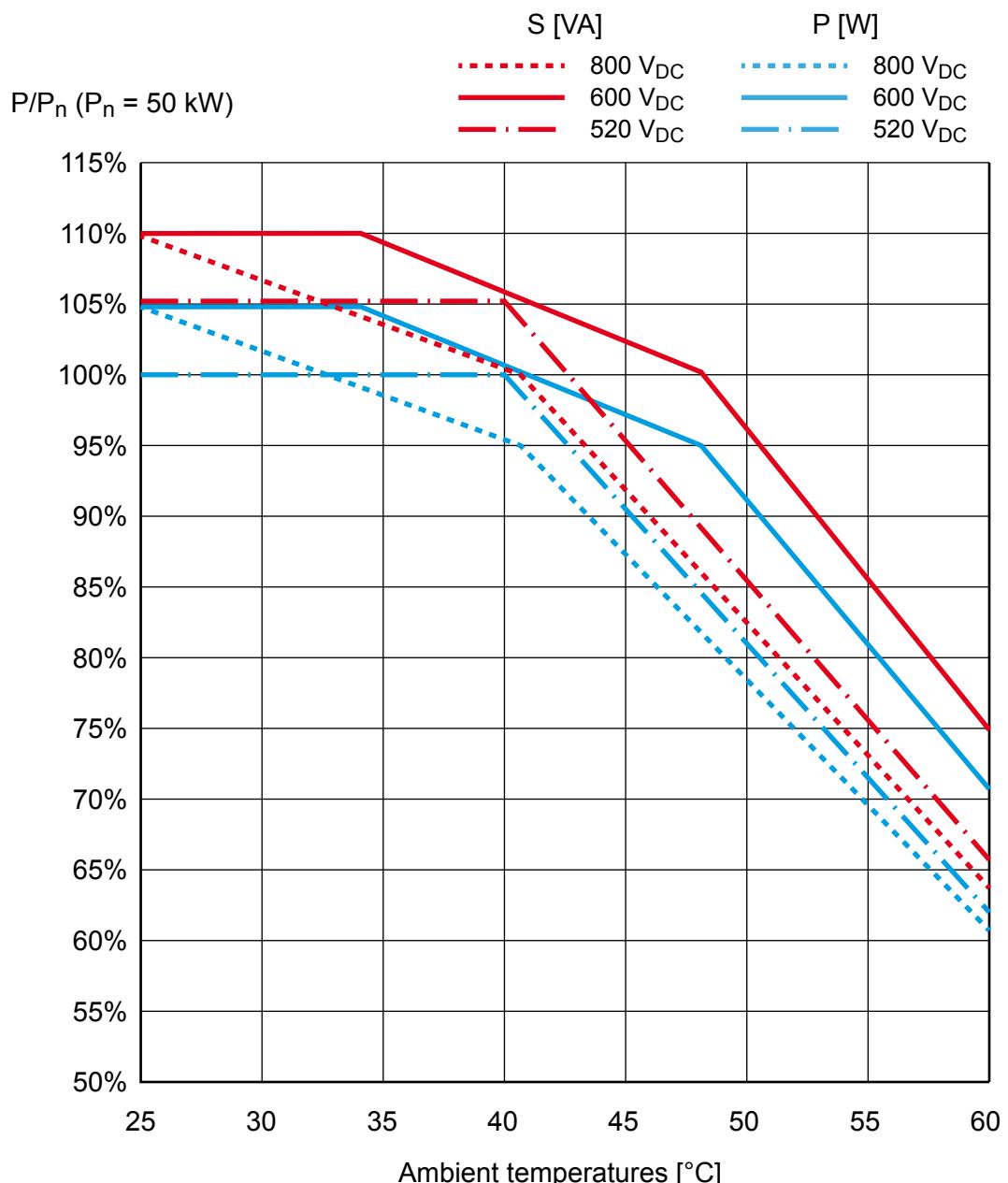


Fig. 5.7: Temperature derating curve ($\cos \varphi = 0.95$)

5 Planning the installation

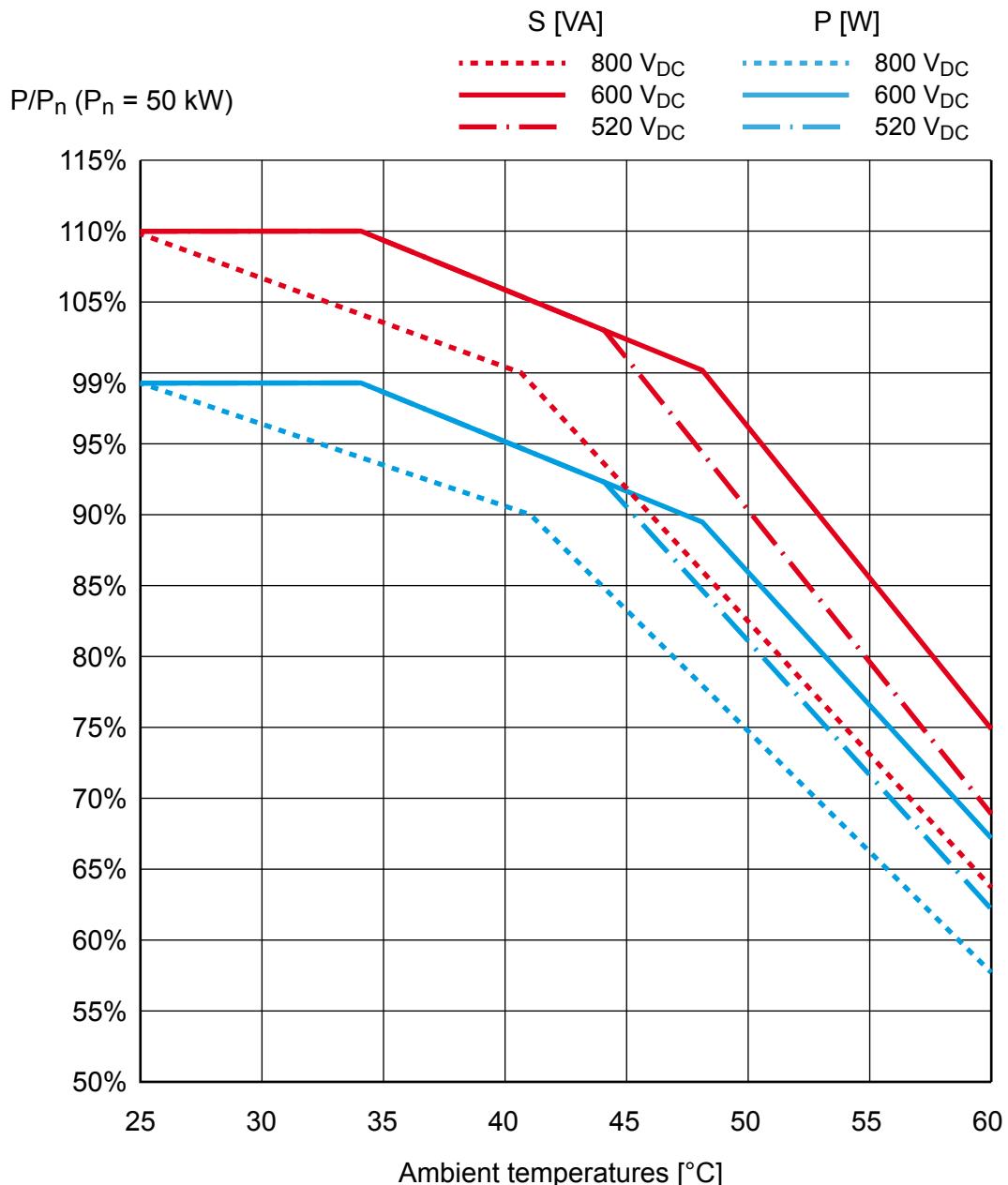


Fig. 5.8: Temperature derating curve ($\cos \varphi = 0.90$)

5.5 Efficiency curve

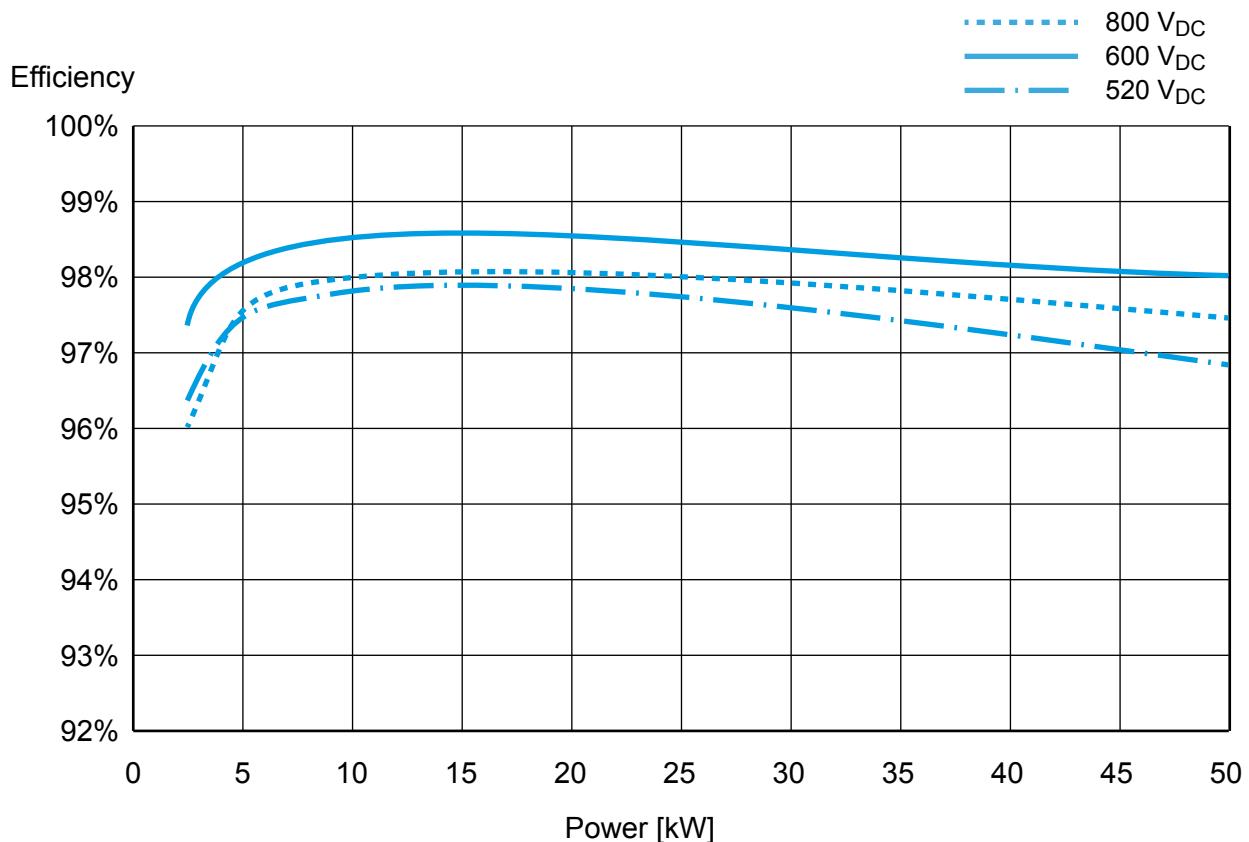


Fig. 5.9: Efficiency curve

5 Planning the installation

5.6 Dimensions

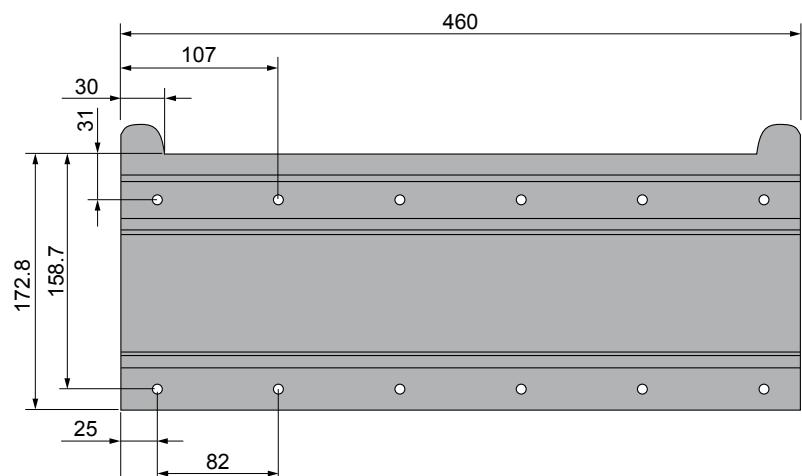


Fig. 5.10: Dimensions of mounting plate

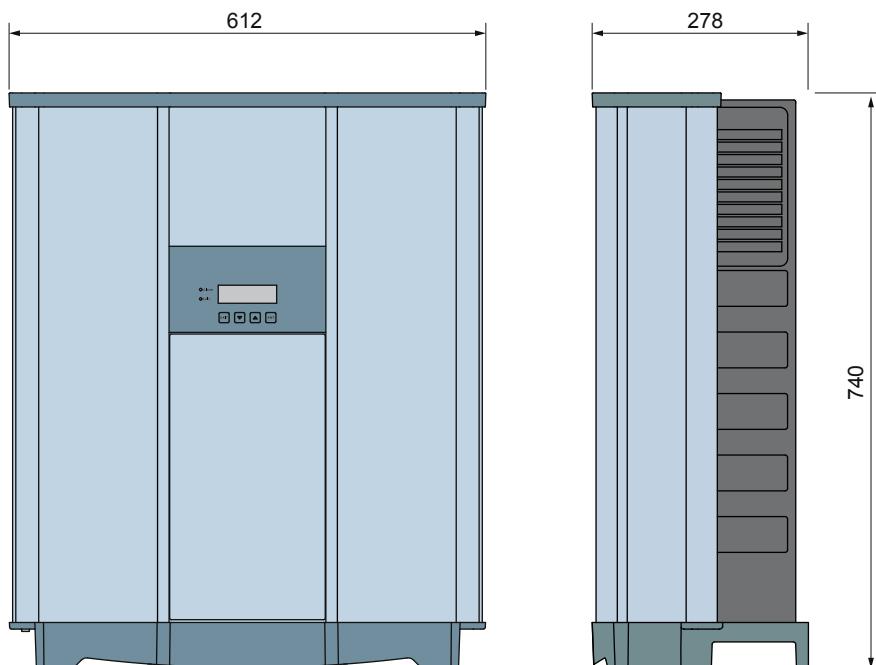


Fig. 5.11: Dimensions of inverter

5.7 AC connection

Always adhere to the specific regulations applicable in your country or region.

Always adhere to the specific regulations defined by your grid operator.

For the safety of the user and for the security of your installation, install required safety and protection devices that are applicable for your installation environment (example: automatic circuit breaker and/or overcurrent protection equipment).

Use the proper upstream circuit breaker to protect the inverter:

Model	Upstream Circuit Breaker
RPI M50A	100 A

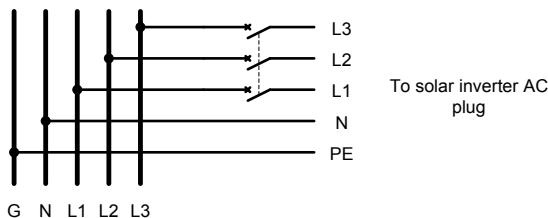


Fig. 5.12: Where to place upstream circuit breakers in the system

The inverter is not capable of feeding in DC residual currents due to its design. It fulfills this requirement in accordance with DIN VDE 0100-712.

The possibilities of faults were examined by Delta without taking the integrated RCMU (residual-current monitoring unit) into account. When examining these faults in terms of the current valid installation standards, no danger in combination with a type A upstream residual-current device (RCD) can occur. Therefore faults that would otherwise require the use of a type B residual-current device due to the inverter can be excluded.

The integrated all-pole sensitive RCMU is certified according VDE 0126 1-1/A1:2012-02 §6.6.2 for a tripping current of 300 mA. RCD Type A can be used for this inverter, according to the following table.

M50A		
Minimum tripping current of the RCD	mA	≥300

NOTE



The value of the tripping current mainly depends on the quality of the solar modules, the size of the PV array and environmental conditions (e.g. humidity). The tripping current of the residual current device must not be less than the specified minimum tripping current.

Permitted earthing systems

Earthing System	TN-S	TN-C	TN-C-S	TT	IT
Permitted	Yes	Yes	Yes	Yes	No

AC grid voltage requirements

3P3W		3P4W	
L1-L2	400 V _{AC} ± 20%	L1-N	230 V _{AC} ± 20%
L1-L3	400 V _{AC} ± 20%	L2-N	230 V _{AC} ± 20%
L2-L3	400 V _{AC} ± 20%	L3-N	230 V _{AC} ± 20%

5 Planning the installation

5.8 DC connection

NOTICE



Machine and equipment damage may occur.

Exceeding the maximum current per DC input can cause an overheating of the DC inputs.

► Always consider the maximum current of the DC inputs when planning the installation.

5.8.1 Symmetrical and asymmetrical power input

The inverter operates using two separate MPP trackers that can handle both symmetrical and asymmetrical power input. This allows you to set up complex PV system designs. For example: east/west-facing roof (asymmetrical load) or a south facing roof such as a dormer (asymmetrical load).

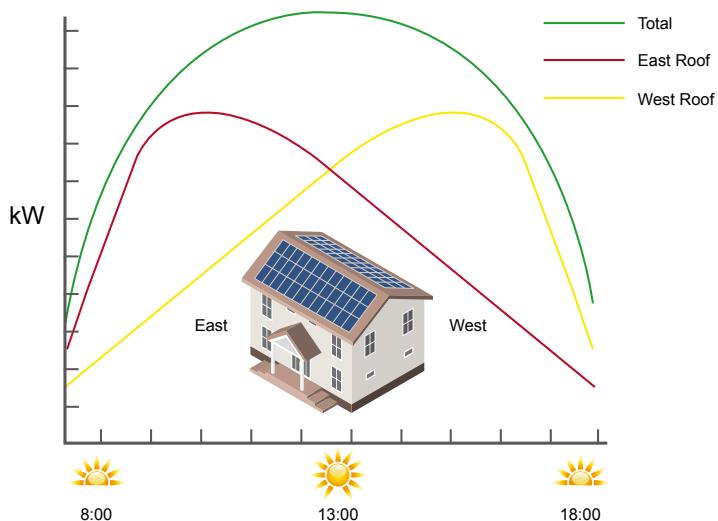
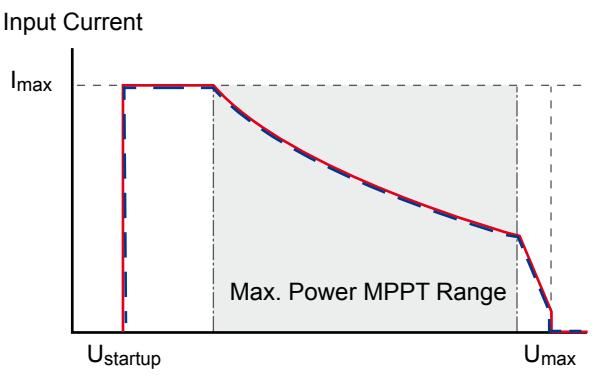


Fig. 5.13: Concept of 2-MPP-tracker system for asymmetrical power input

The following figures explain how symmetrical and asymmetrical power input is handled:

Symmetrical power input



Asymmetrical power input

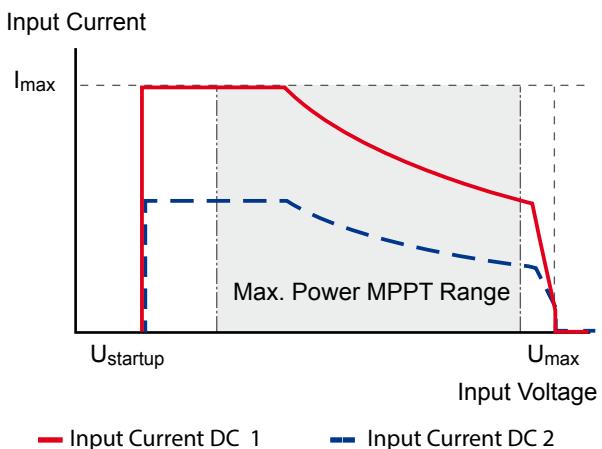


Fig. 5.14: I-U curve for symmetrical and asymmetrical power input (schematic diagrams)



For currents and voltages see “13. Technical data”, p. 105.

5.8.2 Use with solar modules that do not need to be grounded.

When you use PV modules that do not need to be grounded, you can connect the DC inputs separately or in parallel.

“Separate DC inputs” means each DC input is connected to a separate MPP tracker. “Parallel DC inputs” means both DC inputs are connected to one MPP tracker. With parallel DC inputs you cannot realize asymmetrical power inputs.

PV arrays can be connected to the inverter directly or externally parallel connection at DC distribution box.

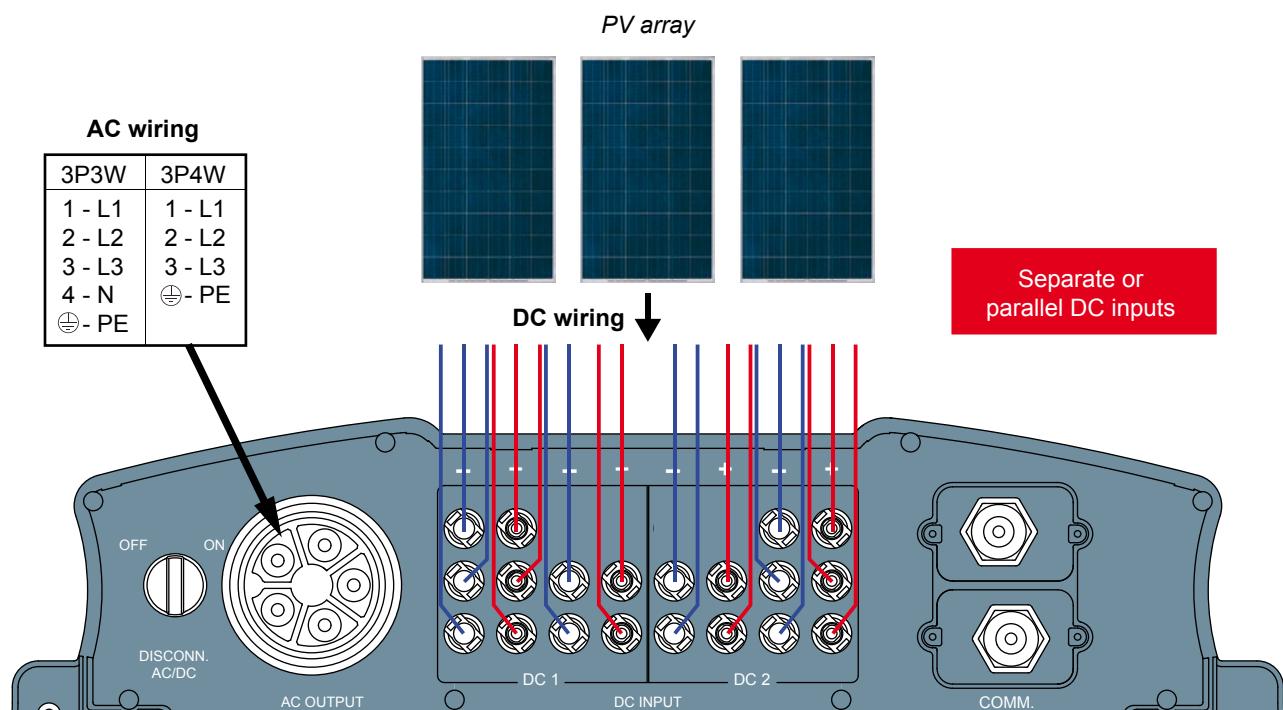


Fig. 5.15: System design with floating DC inputs

5 Planning the installation

5.8.3 Use with solar modules that have to be grounded.

NOTICE



Machine and equipment damage may occur.

- ▶ When the DC inputs are grounded, all of the strings must be connected in parallel and then connected to the inverters.
- ▶ Additionally, an external isolation transformer must be installed on the AC side, otherwise, damage will result and the inverter will not work properly.

When the DC inputs are grounded, all of the strings must be connected in parallel and then connected to the inverter(s).

When the solar modules need to be grounded, an external isolation transformer has to be implemented to the AC side of the PV system as shown in Fig. 5.16, p. 28.

Depending on the DC connection type, different settings for insulation detection are needed, see "8.7 Insulation mode and insulation resistance", p. 59.

You have to prepare the inverter for use with grounded solar modules, see Fig. 5.17, p. 29 and Fig. 5.18, p. 30. Because you have to remove the cover of the fuse section, you should do this before you hang the inverter on the wall and do it in a dry environment. For a detailed description how to do this, see "6.5 Connecting to the solar modules (DC)", p. 42.

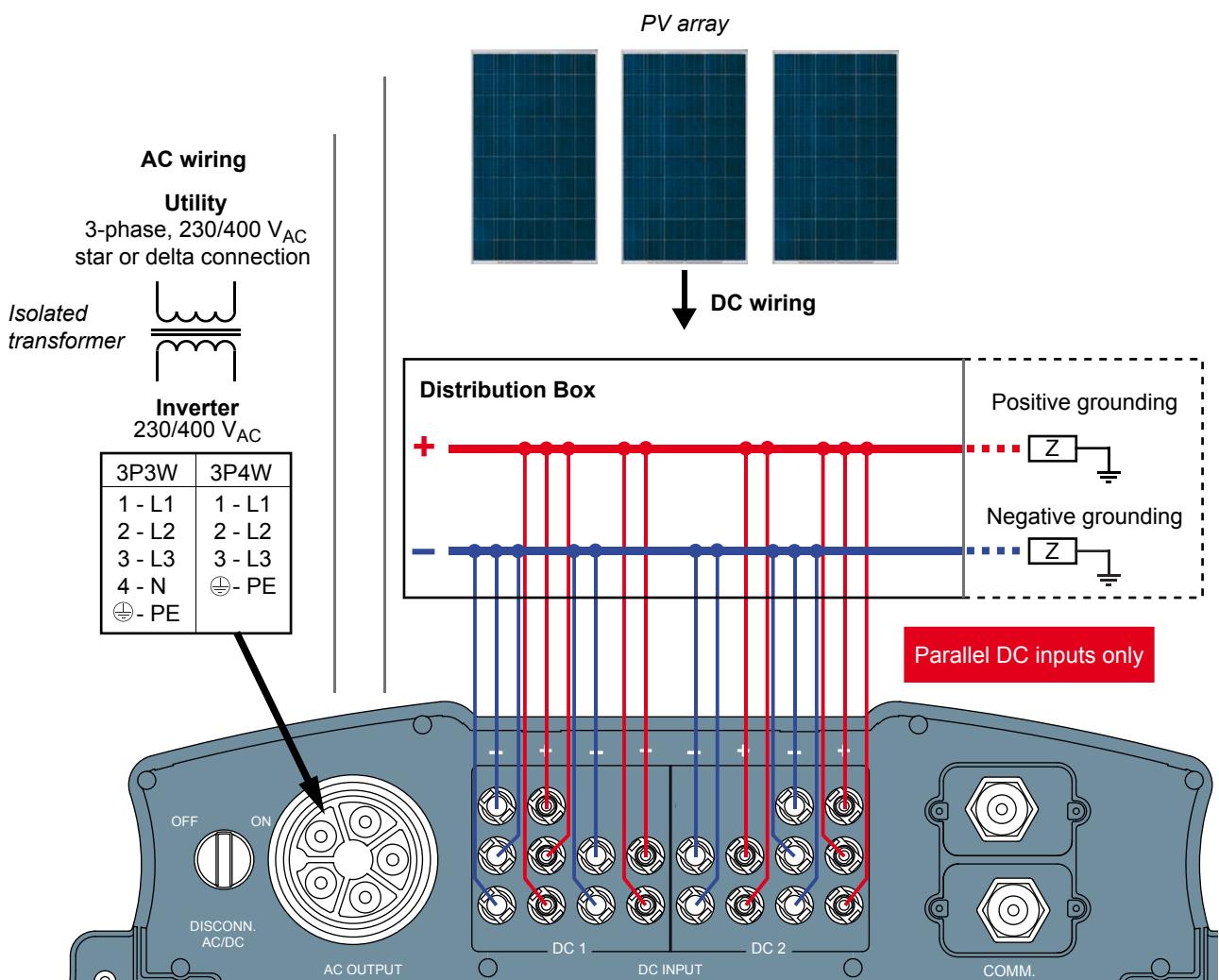


Fig. 5.16: System design with positive or negative grounding of the solar modules

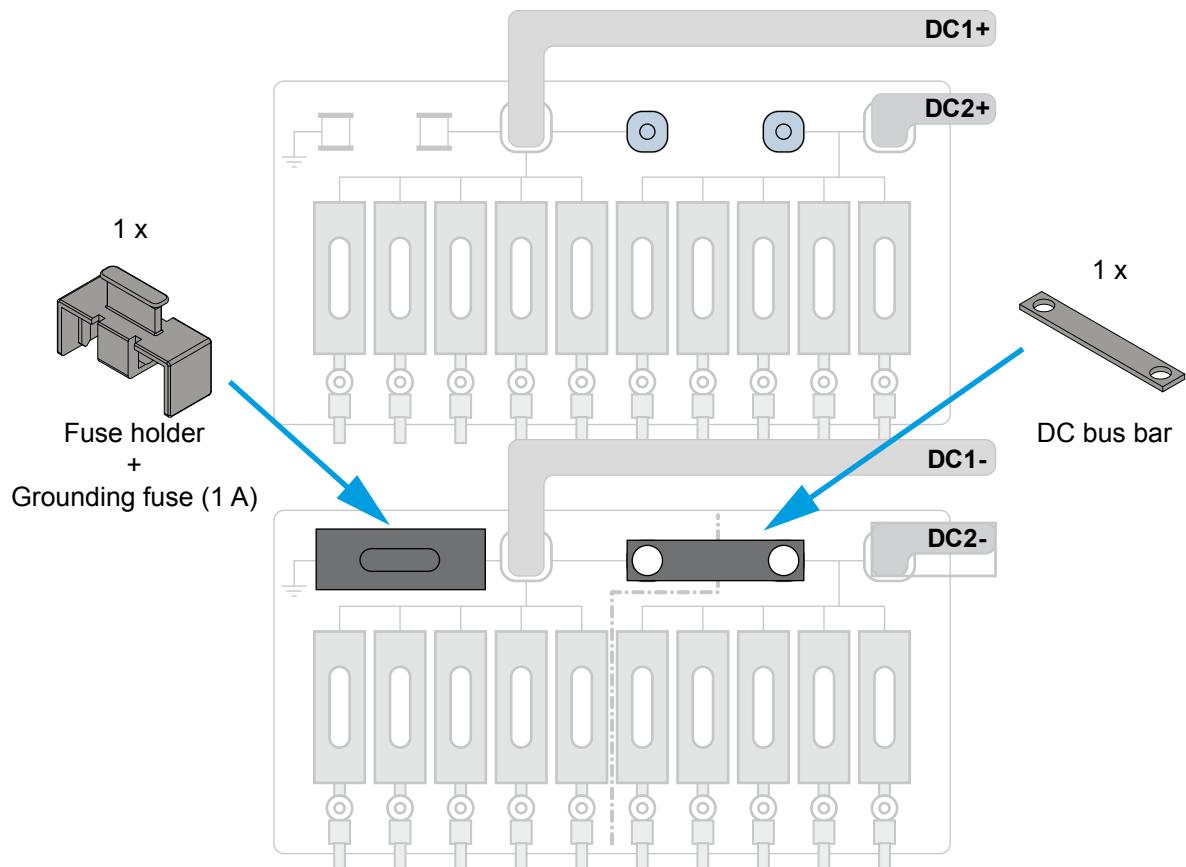


Fig. 5.17: Preparing the inverter for use with minus grounded solar modules



Fuse holder and DC bus bars are delivered with the inverter. The screws are already fastened inside the inverter. You have to provide a grounding fuse with 1 A.

5 Planning the installation

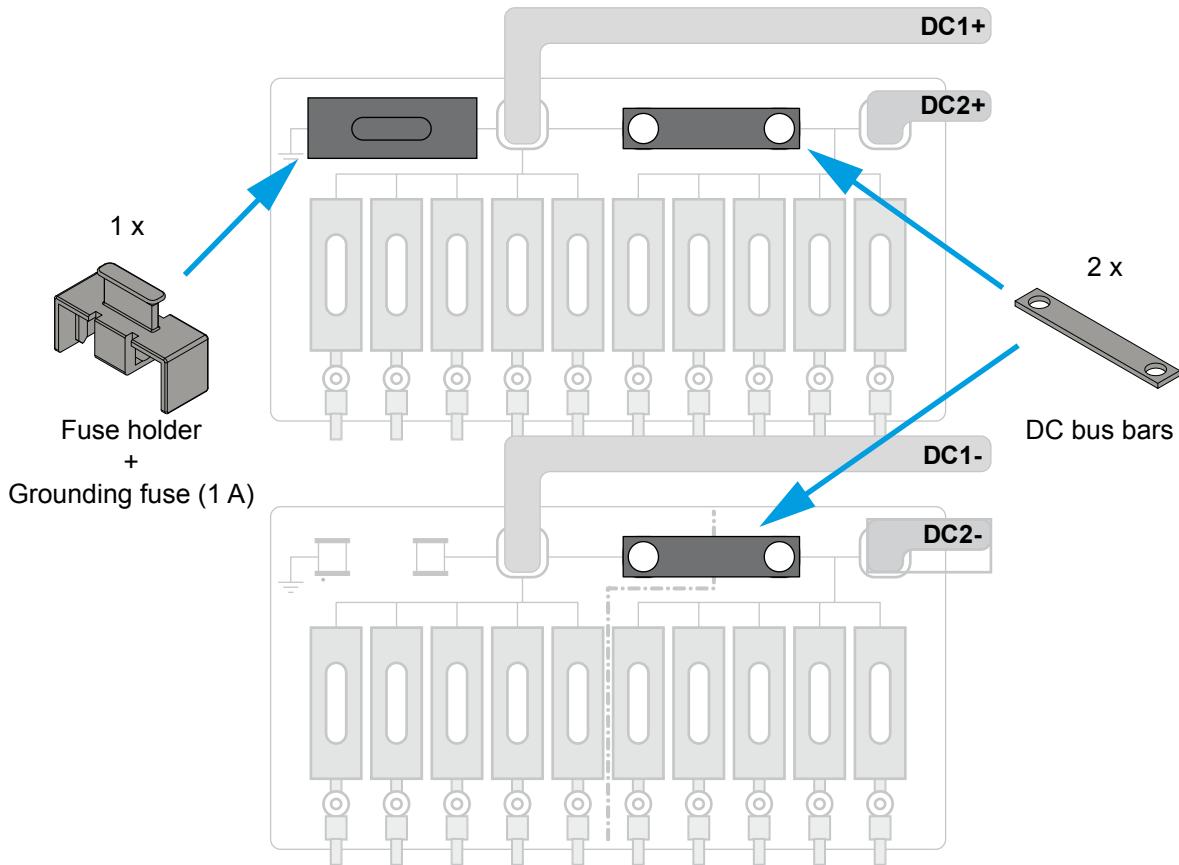


Fig. 5.18: Preparing the inverter for use with plus grounded solar modules



Fuse holder and DC bus bars are delivered with the inverter. The screws are already fastened inside the inverter. You have to provide a grounding fuse with 1 A.

5.8.4 Using DC1 and DC2 with only one MPP tracker

When you want to use DC1 and DC2 with only one MPP tracker, you have to prepare the inverter as shown in [Fig. 5.19, p. 31](#).

Because you have to remove the cover of the fuse section, you should do this before you hang the inverter on the wall and do it in a dry environment.

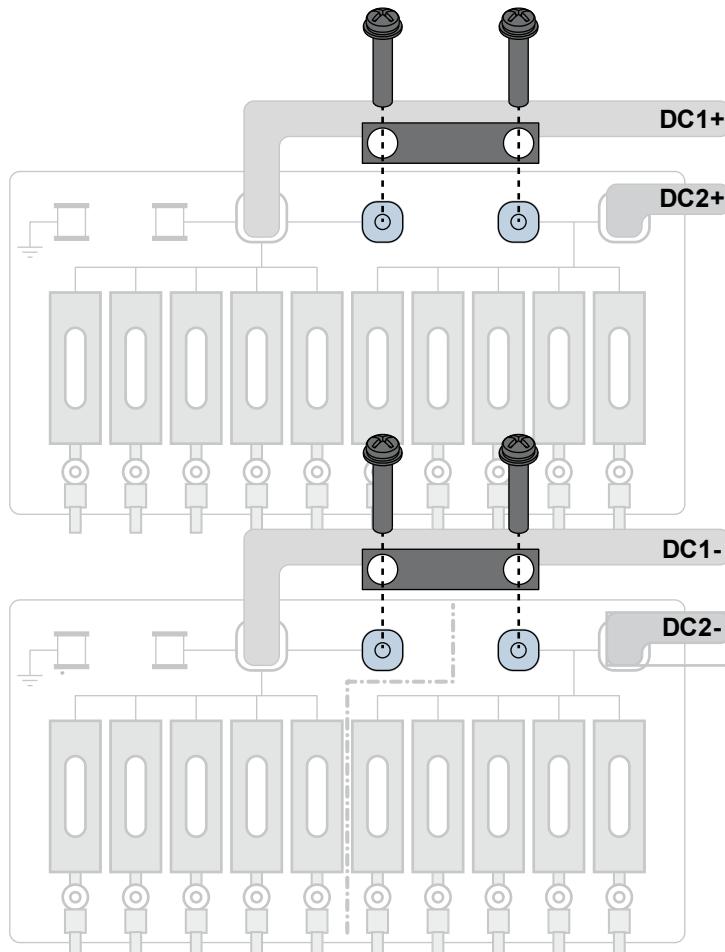


Fig. 5.19: Preparing the inverter for use with only one MPP tracker

5 Planning the installation

5.9 Connecting to a datalogger via RS485

The inverter can be connected to a datalogger via RS485, e.g. for monitoring, changing settings or software updates.

To ensure the proper work of the data connection, consider the following recommendation and instructions.

For a detailed description how to perform the activities described in this section, see “[6.7 Connecting communication port I \(optional\)](#)”, p. 45.

When you connect a single inverter

- The termination resistor has to be switched on.

When you connect multiple inverters within the same PV system

- On the **last** inverter in the chain, the termination resistor has to be switched on.
- If your datalogger has no internal termination resistor, the termination resistor on the **first** inverter in the chain has to be switched on too.
- To each inverter a different inverter ID has to be applied. This is necessary, so that the datalogger or the maintenance software can identify each inverter in the chain.
- The baud rate has to be the same on each inverter.

Cable and wire requirements

- Twisted and shielded cables with 2 solid wires.
- Cable diameter: 5 mm
- Wire cross-section: 1 mm²
- The RS485 cables should lay with distance from the AC cable and the DC cables to avoid interferences.

5.10 Circuit diagram of string fuses and SPDs

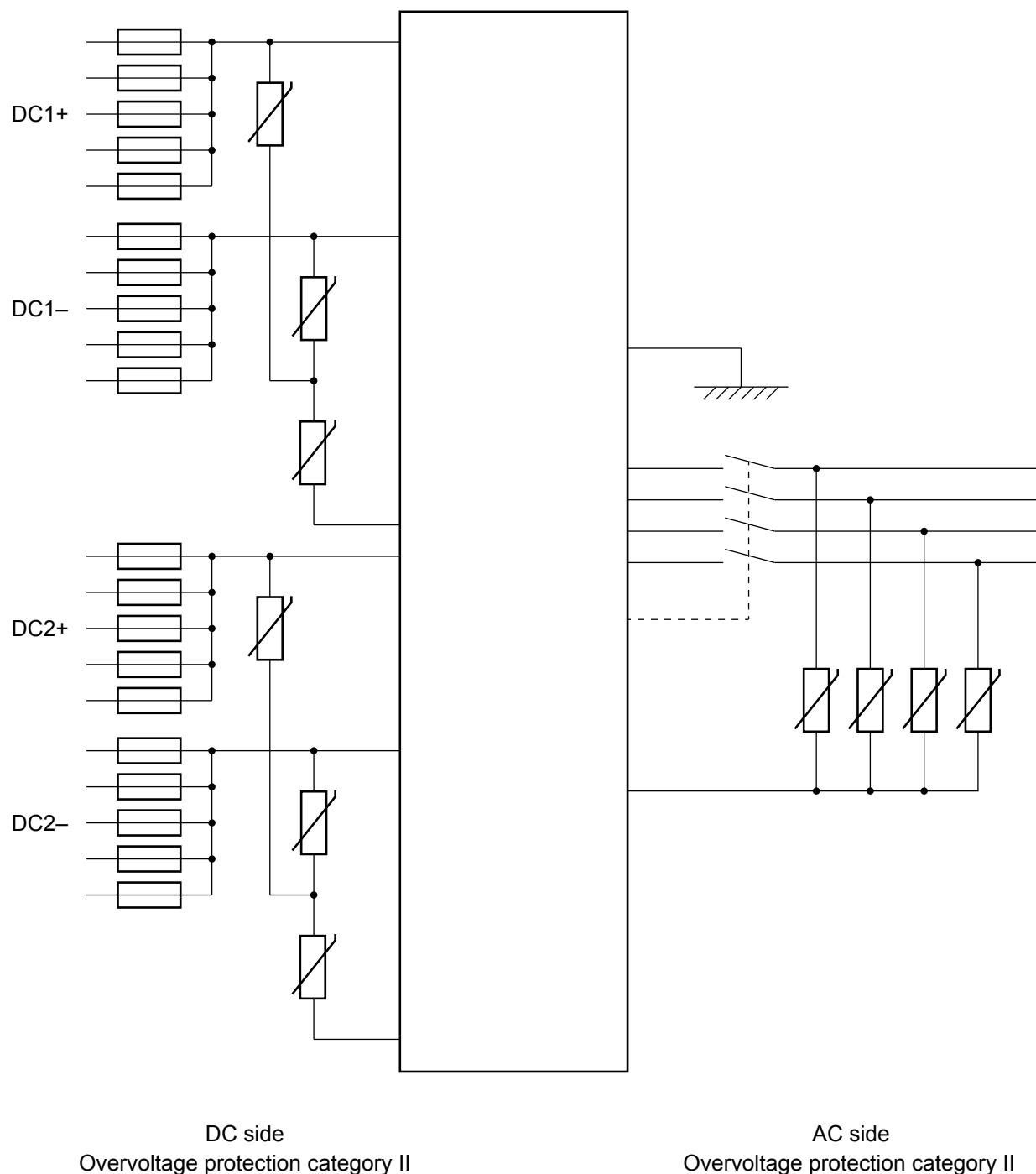


Fig. 5.20: Circuit diagram string fuses and surge protection devices

5 Planning the installation

5.11 What you need

Beside the parts delivered with the inverter (see “[4.1 Scope of delivery](#)”, p. 10), you may need the following additional parts and tools.

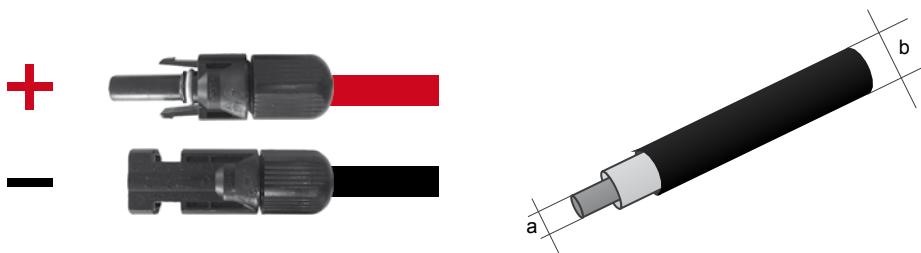
Part	Quantity	Image/Description										
For mounting the inverter												
M6 mounting screws	12	<p>The mounting plate has to be mounted with 12 M6 screws.</p> <p>Depending on where you mount the inverter (e. g. on a brick wall, concrete wall, metal frame etc.) you may need additional mounting material.</p> <p>This could be:</p> <p>Wall plugs, washers, washer springs, nuts etc.</p>										
For connecting the inverter to the grid (AC)												
AC cable	-	<p>Use properly sized wire to connect to the correct poles (see table)</p> <table><tbody><tr><td>AC connector</td><td>China Aviation Optical-Electrical Technology Co. PVE5T125KE36</td></tr><tr><td>Current rating</td><td>100 A</td></tr><tr><td>Min. / Max. cable diameter</td><td>37 ... 44 mm</td></tr><tr><td>Min. / Max. wire size</td><td>25 ... 35 mm²</td></tr><tr><td>Recommended torque for terminal screws</td><td>3 Nm</td></tr></tbody></table>	AC connector	China Aviation Optical-Electrical Technology Co. PVE5T125KE36	Current rating	100 A	Min. / Max. cable diameter	37 ... 44 mm	Min. / Max. wire size	25 ... 35 mm ²	Recommended torque for terminal screws	3 Nm
AC connector	China Aviation Optical-Electrical Technology Co. PVE5T125KE36											
Current rating	100 A											
Min. / Max. cable diameter	37 ... 44 mm											
Min. / Max. wire size	25 ... 35 mm ²											
Recommended torque for terminal screws	3 Nm											
<p>AC plug delivered with the inverter can be used with flexible copper cable.</p> <p>When calculating the cross section of the cable, consider:</p> <ul style="list-style-type: none">• material used• thermal conditions• cable length• type of installation• AC voltage drop• power losses in cable <p>Always follow the system installation requirements defined for your country!</p> <p>France: Follow the system installation requirements defined by UTE 15-712-1 regarding minimum cable sections and protections against overheating due to high currents!</p> <p>Germany: Follow the system installation requirements defined by VDE 0100 712 regarding minimum cable sections and protections against overheating due to high currents!</p> <p>For a description how to connect the AC cable to the AC connector see “6.4 Connecting to the grid (AC)”, p. 40.</p>												

5 Planning the installation

Part	Quantity	Image/Description
Wire ferrules (bootlace pins) and crimping tool	4 or 5	<p>Wire ferrules are needed for the wires of the AC cable to tightly mount them to the AC connector.</p> <p>4 (for 3-wire systems with 3 phases + PE)</p> <p>5 (for 4-wire systems with 3 phases + N + PE)</p> <p>You should use a crimping tool to fasten the wire ferrules to the wire.</p> 

For connecting the inverter to the solar modules (DC)

DC cable and DC plugs



10 pairs of DC plugs for the DC cable are delivered with the inverter: 32.0016P0001-UR and 32.0017P0001-UR. Follow the description in the table below if you need additional DC plugs.

DC connectors on the inverter	Plugs for DC cable		
	a mm ²	b mm	Multi-Contact
DC-	4/6	3-6	32.0014P0001-UR
		5.5-9	32.0016P0001-UR
DC+	4/6	3-6	32.0015P0001-UR
		5.5-9	32.0017P0001-UR
Safety caps	10	5.5-9	32.0034P0001
		5.5-9	32.0035P0001

Safety caps	up to 20	Safety caps secure the DC cables to the DC inputs so that they cannot be removed without a special tool. To remove the safety caps, an <i>open end spanner</i> is needed. The safety caps must be used in France. Please check local regulations whether you have to use safety caps.
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5 Planning the installation

Part	Quantity	Image/Description
Open end spanner	1	The open end spanner is used to disconnect the DC cables from the DC inputs.



For grounding the inverter housing

Cables	Typically yellow/green copper cable with minimum wire size 6 mm ² has to be used. Always consider local regulation regarding the cable requirements.
--------	---

For wiring the communication port

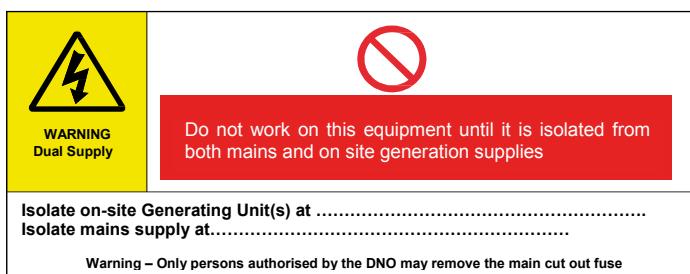
Cables	Depending on which connectors you want to use (RS485, dry contacts, digital inputs), you need the appropriate cables with wire size 1 mm ² .
--------	---

For using the inverter with grounded solar modules

Magnetic screw driver	1	If you need to open the cover of the fuse section, you should use a magnetic screw driver, so that the screws cannot accidentally fall into the inverter.
Grounding fuse	1	A grounding fuse with 1 A is needed. The fuse holder is delivered with the inverter.

Other parts

Labels	-	Check local regulations whether you have to attach special safety labels to the inverter.
--------	---	---



Isolate both sources before carrying out any work



Warning
Two sources of voltage present
- distribution network
- photovoltaic panels

6. Installation

6.1 Safety instructions

DANGER

High electrocution



Potentially fatal voltage is applied to the solar inverter during operation. This potentially fatal voltage is still present for 10 seconds after all power sources have been disconnected.

- ▶ Always disconnect the inverter from power before installation, open the AC/DC isolating switch and make sure neither can be accidentally reconnected.
- ▶ Only the cover from the fuse section may be removed. Never open other parts of the inverter.
- ▶ Wait at least 10 seconds until the capacitors have discharged.

WARNING

High electrocution



When you remove the cover from the fuse section, protection degree is no longer IP65.

- ▶ Remove the cover only when it is really necessary.
- ▶ Do not remove the cover when it is raining and the inverter is wet.
- ▶ Close the cover tightly after work.

WARNING

Heavy weight



The inverter weighs about 73 kg.

- ▶ The inverter must be lifted and carried by at least three people or with an appropriate lifting equipment.



Read chapter “[5. Planning the installation](#)”, p. 18 and this chapter **before** you start installation.

6 Installation

6.2 Mounting the inverter

WARNING



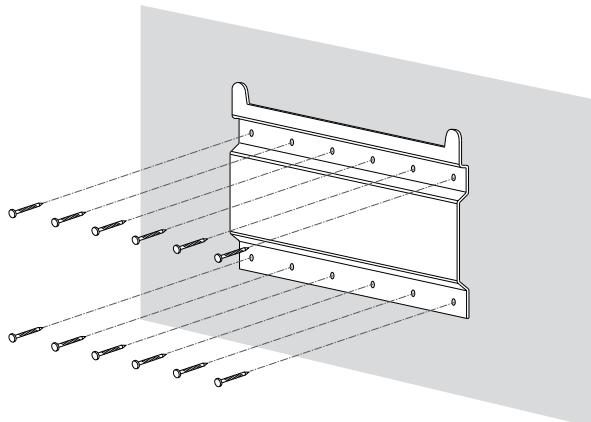
Heavy weight

- The inverter must be lifted and carried by at least three people or with an appropriate lifting equipment.
- Always use the mounting plate delivered with the inverter.

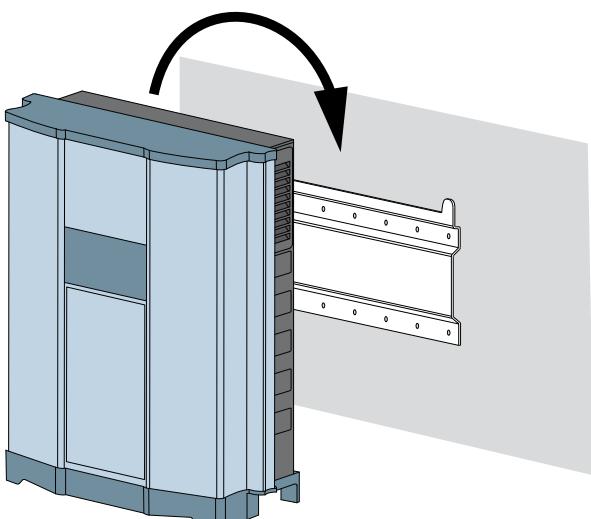


Read chapter “[5. Planning the installation](#)”, p. [18](#) before you start installation.

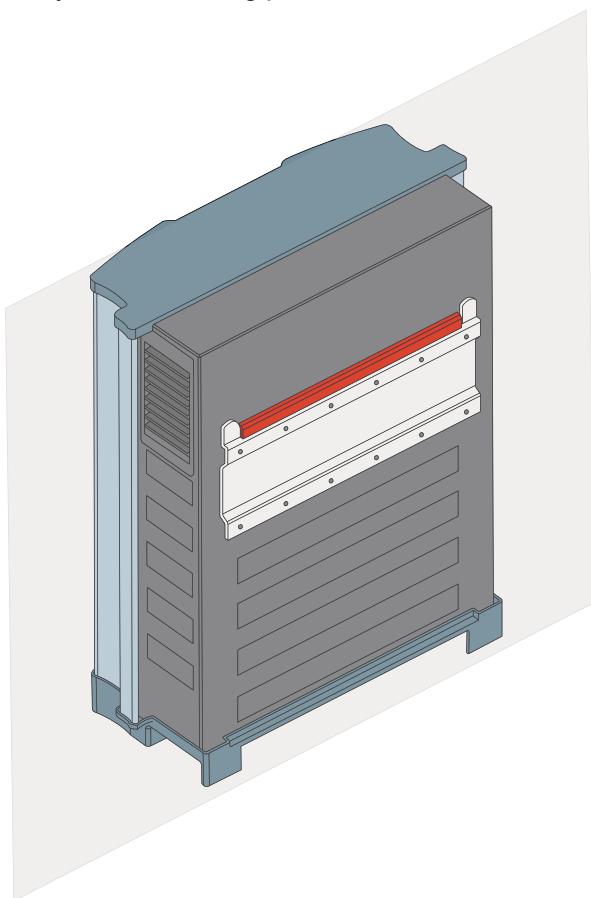
1. Attach the mounting plate with 12 M6 screws to the wall or to your mounting system. Use the appropriate type and number of screws.



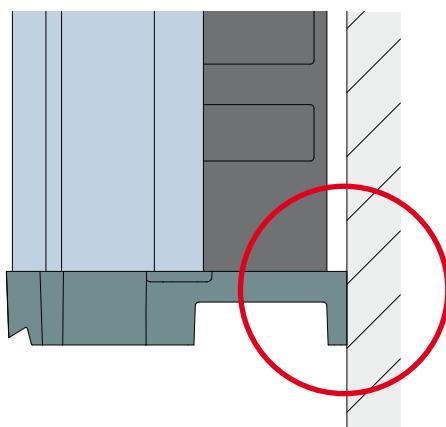
2. Hang the solar inverter onto the mounting plate.



3. Check that the rail of the solar inverter hangs correctly in the mounting plate.



4. Check that the bottom of the inverter is firmly positioned against the wall or the mounting system. Also check that the inverter hangs vertically in all directions.



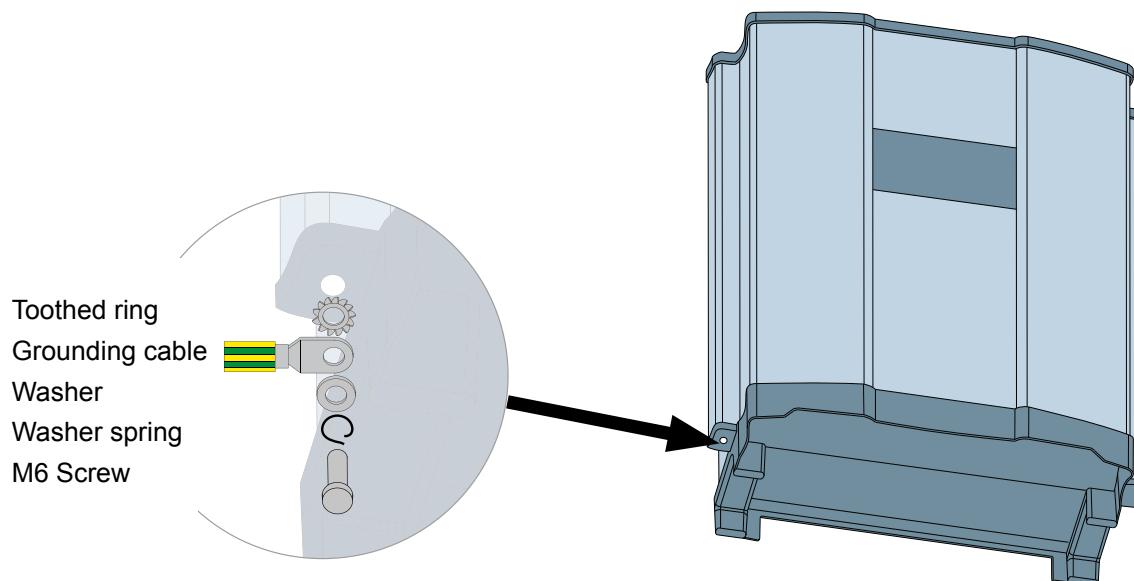
6.3 Grounding the inverter housing

Typically yellow/green copper cable with minimum wire size 6 mm² has to be used.

Always consider local regulation regarding the cable requirements.

Even when such regulations do not exist, it is usually a good idea to ground the inverter housing for safety reasons before you set-up the electrical connections. Although there is an PE connection within the AC connection.

1. On the left side, ground the inverter housing. The grounding screw is delivered with the inverter and mounted to the inverter.



6 Installation

6.4 Connecting to the grid (AC)



Read chapter "5. Planning the installation", p. 18 before you start installation.

What you need

- AC plug (delivered with the inverter)
- AC cable
- Wire ferrules (bootlace pins)
- Crimping tool for wire ferrules

Important information regarding safety

DANGER



Risk of death or serious injury from electrocution

- Set the AC/DC disconnection switch to position **OFF** before connecting or disconnecting the AC plug to the inverter.



Wiring for 3P4W grid systems: 3 phases with 5 wires (L1, L2, L3, N) + PE

Use wire end sleeves (bootlace pins) on each wire.

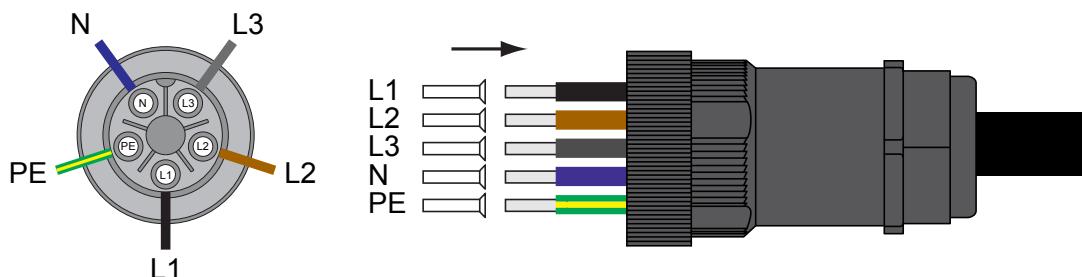


Fig. 6.26: Wiring AC plug for 5-wire systems

Wiring for 3P3W grid systems: 3 phases with 4 wires (L1, L2, L3) + PE

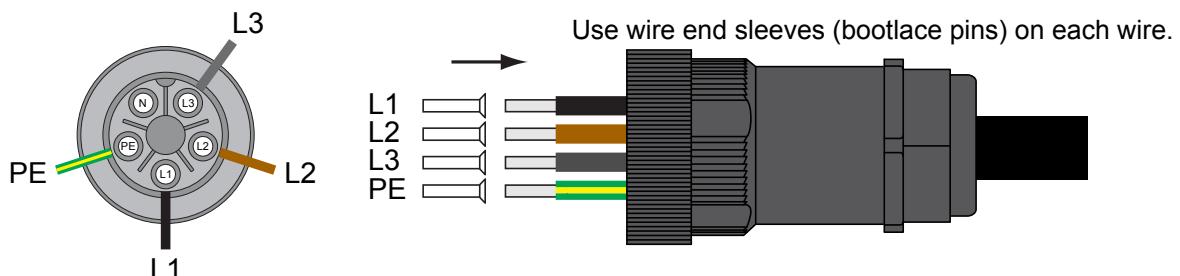


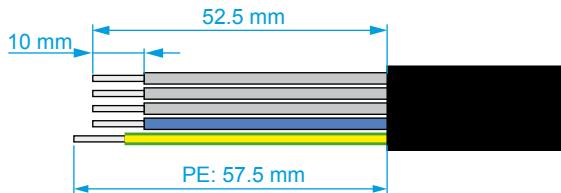
Fig. 6.27: Wiring AC plug for 4-wire systems

ATTENTION



Observe the correct polarity of the AC plug. An incorrect configuration can destroy the solar inverter.

1. Remove the cable sheath as shown and remove 12 mm of insulation from each wire end.



2. Place the end sleeves on the exposed wire ends and crimp them on.

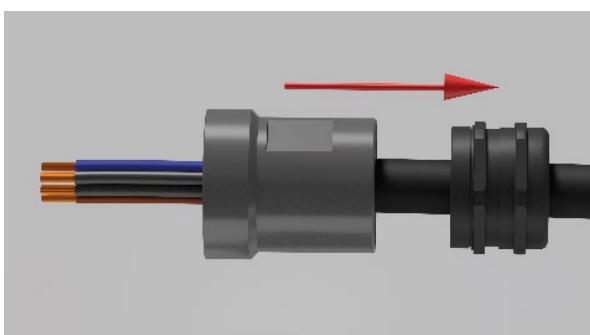


3. Connect the AC cable to the AC plug as described below.

- Unscrew the nut and cable housing from the socket insert.



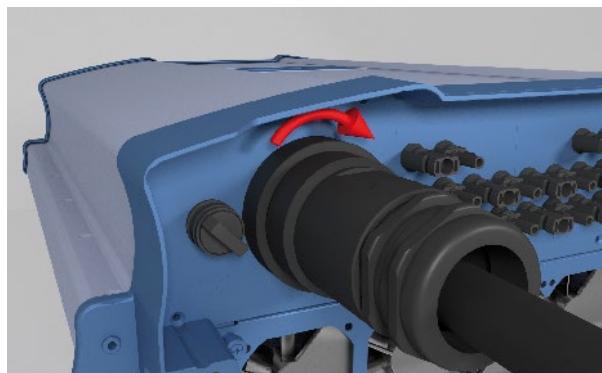
- Slide the nut and cable housing onto the AC cable.



- Slide the wires of the AC cable into the connections in the pin insert and screw tight. Observe the correct phase sequence when doing this.
- Screw the nut ①, cable housing ② and pin insert ③ together. Tighten the nut to 5 Nm and the cable housing to 1-2 Nm.



- Insert the AC plug into the AC socket ② on the solar inverter and tighten the locking ring ① to a torque of 6 to 8 Nm.



- Fit a cable strain-relief clamp directly behind the round plug when using cables of diameters between 11 and 13 mm. We recommend also using a strain-relief clamp for cables of other diameters.

6 Installation

6.5 Connecting to the solar modules (DC)



Read chapter “[5. Planning the installation](#)”, p. 18 before you start installation.

6.5.1 Safety instructions



DANGER



Risk of death or serious injury from electrocution

Potentially fatal voltage may be applied to the DC connections of the solar inverter. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining.

- ▶ Never disconnect the solar modules when the solar inverter is powered.
- ▶ First switch off the grid connection so that the solar inverter cannot feed energy into the grid.
- ▶ Turn the AC/DC isolating switch to position **OFF**.
- ▶ Make sure the DC connections cannot be accidentally touched.

NOTICE



Improperly sized PV array.

An improperly sized PV array can cause damage to the inverter.

- ▶ Consider the technical specifications of the inverter (input voltage range, maximum currents and maximum input power, see “[13. Technical data](#)”, p. 105) when planning the size of the PV array.

NOTICE



Penetrating humidity.

Humidity can penetrate through unused DC connectors into the inverter.

- ▶ To ensure protection degree IP65, protect all unused DC connectors with the caps delivered with the inverter.

NOTICE



Machine and equipment damage may occur.

Exceeding the maximum current per DC input can cause an overheating of the DC inputs.

- ▶ Always consider the maximum current of the DC inputs when planning the installation.

6.5.1.1 Polarity of the solar modules

Check the polarity of the DC voltage before you connect the solar modules. The negative DC pole of the string is connected to the DC-MINUS connector; the positive DC pole to the DC-PLUS connector, see “[Fig. 6.22: Considering the polarity of the solar modules](#)”, p. 42.

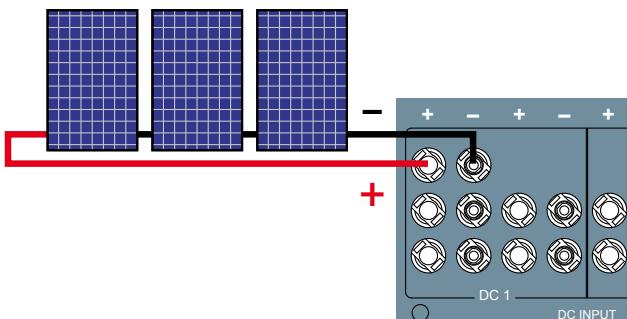


Fig. 6.22: Considering the polarity of the solar modules

6.5.2 Cable specification

Cable colors

Use a red cable for DC+ and a black cable for DC-.



Fig. 6.23: Colors for DC cables

Connector types

The Multi-Contact MC4 are delivered with the inverter. The plugs can also be ordered from Multi-Contact at www.multi-contact.de. The required size depends on the wire cross-section and thickness of the cable used.

DC connector type on the inverter	Counterpiece required for the cable
The DC-MINUS connector is a male socket.	A female plug is required for the black DC cable.
	
The DC-PLUS connector is a male socket.	A male plug is required for the red DC cable.
	

You can download the manual from the Multi-Contact website. This manual will also tell you which tools are required.

	France: Safety caps are needed for each DC input that is connected to a string of solar modules.
	It is recommended to use a special open-end spanner for the MC4 DC connectors if you need to disconnect MC4 DC connectors from the inverter. Otherwise you might destroy the DC Connectors.

6.6 Using DC1 and DC2 with only one MPP tracker (optional)

Only when you want to use DC1 and DC2 on one MPP tracker, you need to connect the DC inputs as described on this page.

WARNING

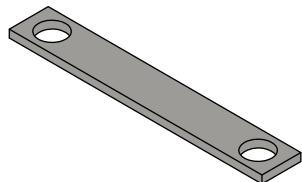


High electrocution

When you remove the cover from the fuse section, protection degree is no longer IP65.

- ▶ Remove the cover only when it is really necessary.
- ▶ Remove the cover only when the inverter is in a dry environment.
- ▶ Close the cover tightly after work.

You need the two DC bus bars delivered with the inverter. The screws are already fastened to the connectors inside the fuse section.

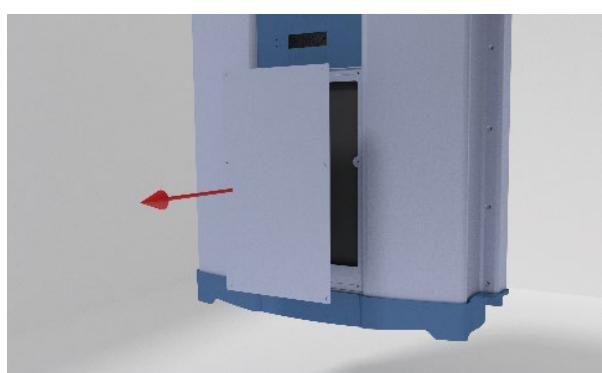


- ▶ You should use a magnetic screw driver, so that the screws cannot accidentally fall into the inverter.

1. Loosen the six screws of the fuse section cover.



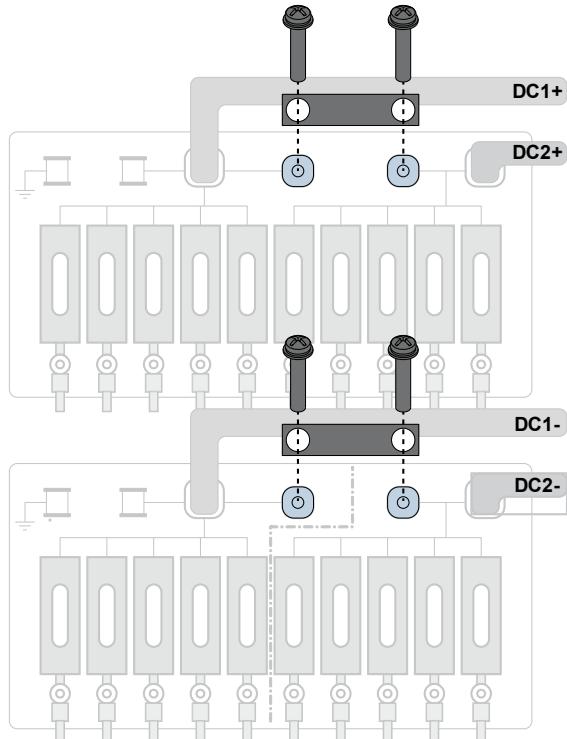
2. Remove the cover from fuse section.



6 Installation

3. Mount one DC bus bar to connect the DC1+ bar and the DC2+ bar.

Mount the other DC bus bar with two DC bar screws to connect the DC1– bar and the DC2– bar.

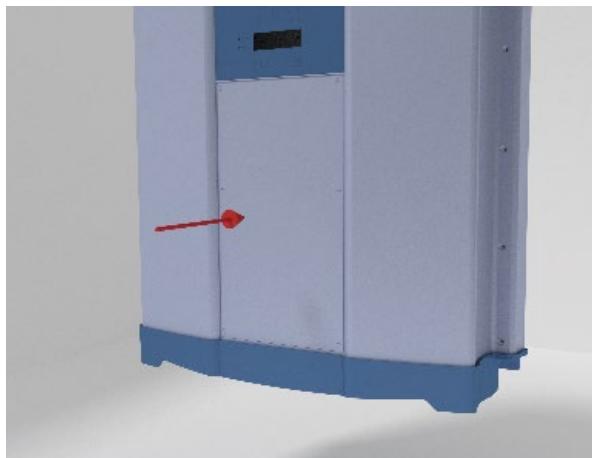
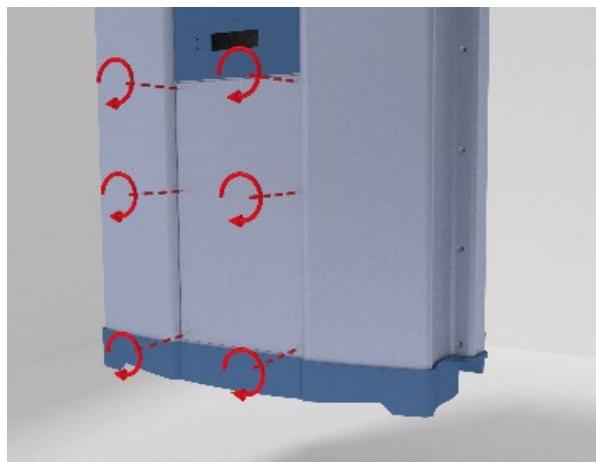


4. Put the cover on the fuse section and screw it tightly with all six screws.

To ensure protection degree IP65, take care that

- the cover is correctly positioned and seals the fuse section,
- the rubber at the fuse cover is not damaged or dirty.

5. Fasten the six screws to the fuse section cover.



6.7 Connecting communication port I (optional)

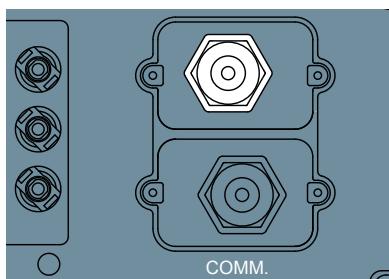


Fig. 6.24: Position of the communication port I on the inverter

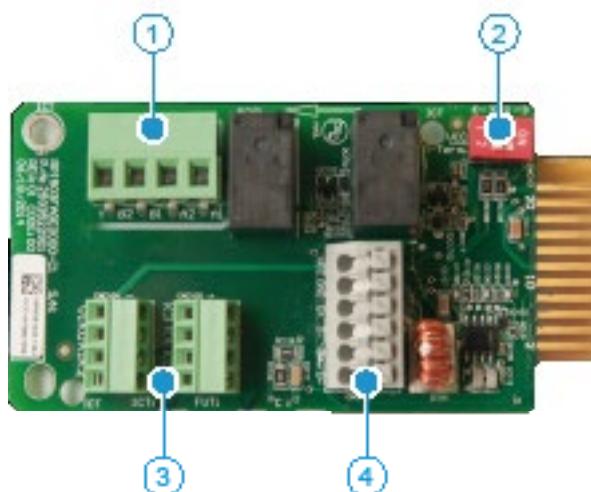


Fig. 6.25: Connectors on the communication card

Pin	Designation
(1)	Dry contacts
(2)	VCC switch and RS485 termination resistor
(3)	DC connectors (DC inputs)
(4)	Communication port 1

6.7.1 RS485 and VCC

RS485 is used to connect the inverters of the PV plant via a datalogger to a monitoring system.

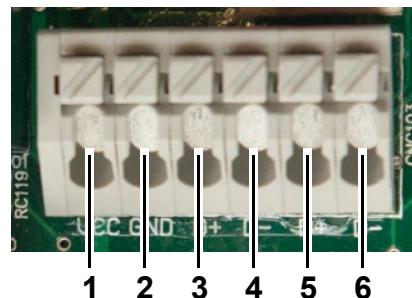
VCC can be used for an external relais. To use VCC, set *DIP switch 1* to **ON**. When you do not use VCC, always set *DIP switch 1* to **OFF**.

For connecting RS485, Pins 3 to 6 are used.

If you want to use SOLIVIA Monitor, the Internet based monitoring from Delta, you will also need a SOLIVIA M1 G2 Gateway.

Default baud rate is 19200 which can be changed on the inverter (see chapter “[8.5 Baud rate for RS485](#)”, p. 57).

Pin assignment



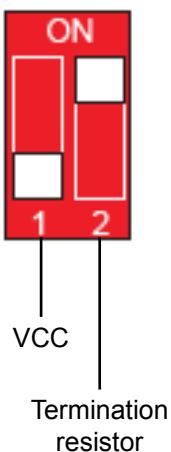
Pin	Designation
1	VCC (+12 V; 0.5 A)
2	GND
3	DATA+ (RS485)
4	DATA- (RS485)
5	DATA+ (RS485)
6	DATA- (RS485)

Data format

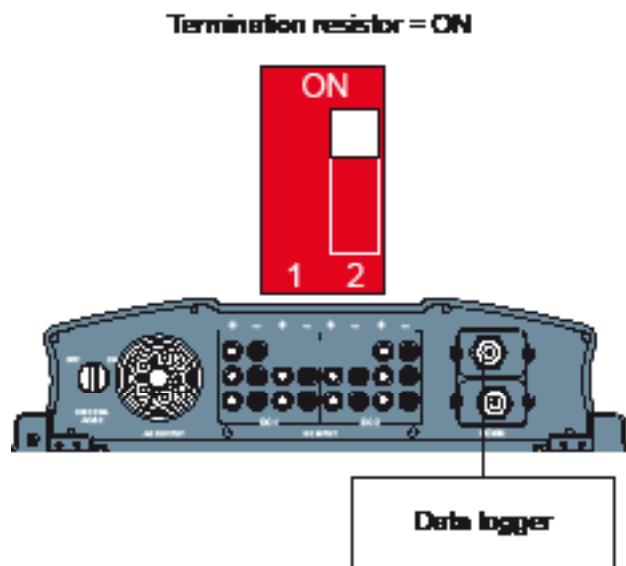
Baud rate	9600, 19200, 38400; Standard: 19200
Data bits	8
Stop bit	1
Parity	not applicable

6 Installation

Switch for VCC and termination resistor

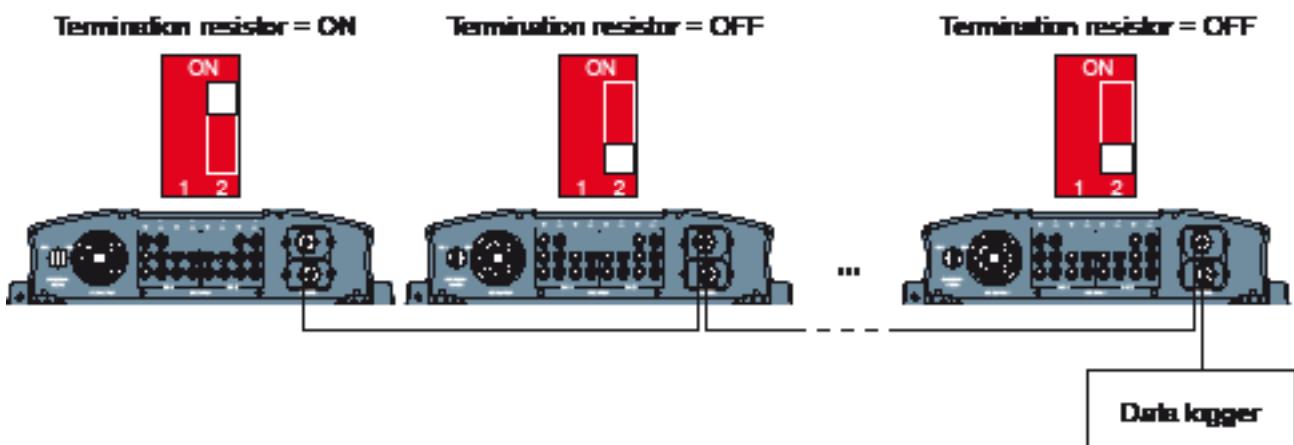


Connecting a single inverter to a datalogger



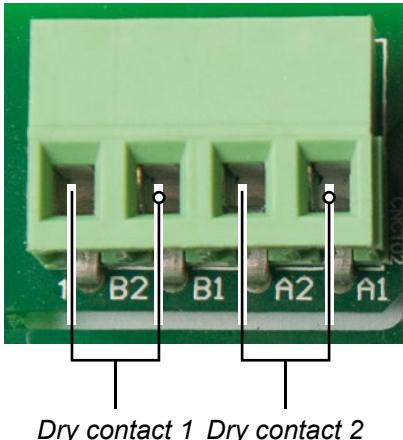
Connecting multiple inverters to a datalogger

If your datalogger has no integrated termination resistor, switch on the termination resistor on the first inverter in the RS485 line.



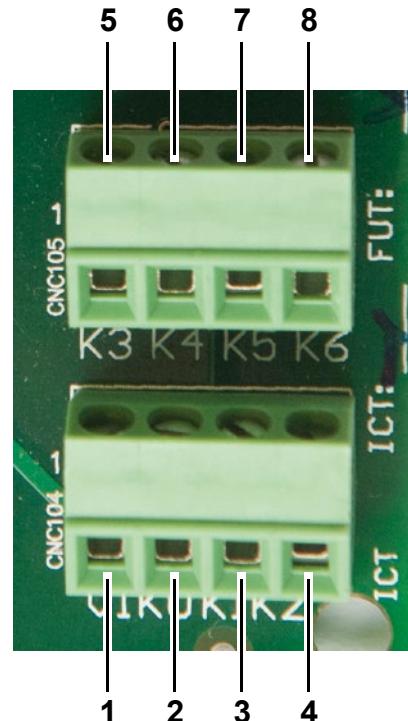
6.7.2 Dry contacts

When the fans fail, *Dry contact 1* is closed.
When the inverter feeds into the grid, *Dry contact 2* is closed.



6.7.3 Digital inputs and EPO

The digital inputs can be used to connect an external ripple control receiver for controlling the active power.



Pin	Design.	Short	Assigned action
1	V1	-	-
2	K0	V1 + K0	EPO (Emergency Power Off)
3	K1	V1 + K1	Set maximum active power to 0%
4	K2	V1 + K2	Set maximum active power to 30%
5	K3	V1 + K3	Set maximum active power to 60%
6	K4	V1 + K4	Set maximum active power to 100%
7	K5	V1 + K5	Reserved
8	K6	V1 + K6	Reserved

The relay for EPO can be set on the display to “normally open” or “normally closed”, see [“8.9 EPO \(External Power Off\)”, p. 67.](#)

6 Installation

6.8 Wiring communication port 1

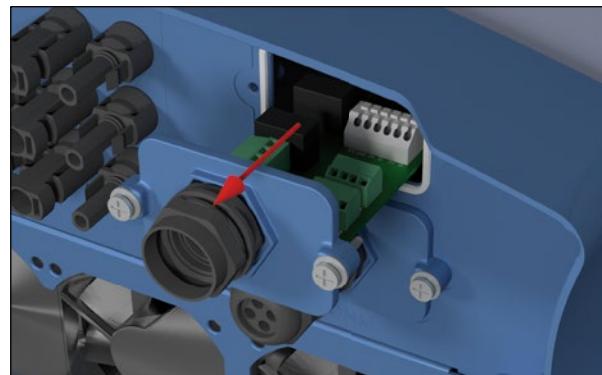
6.8.1 First steps for all cables

Because all communication cables are connected to the same communication port, you should do the complete wiring at once.

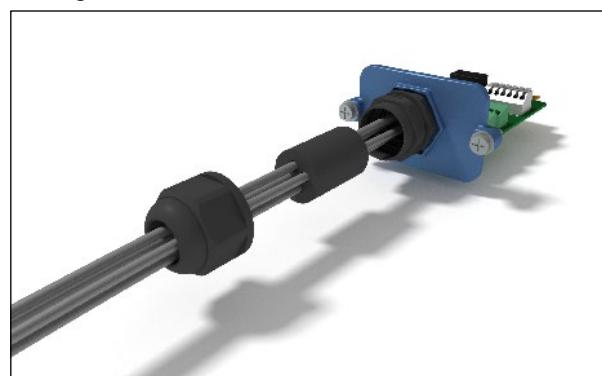
1. Unscrew and remove the bolting.



2. Unscrew and remove the cover.



3. Pull all cables you want to connect through the bolting.



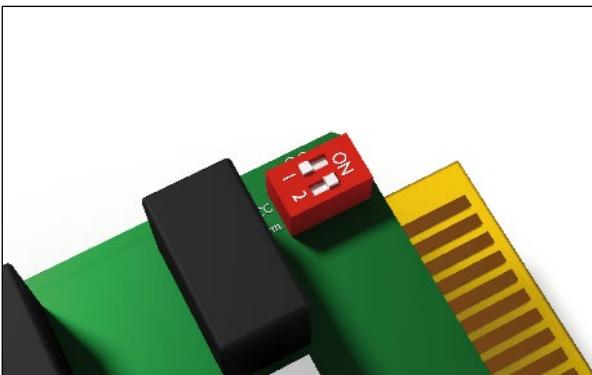
6.8.2 Wiring a single inverter for RS 485

Wiring RS 485 depends on whether you want to connect a single or multiple inverters.

1. Connect the two wires to **Pin D-** and **Pin D+**.



- Switch on DIP switch 2 to turn on the termination resistor.



- On the second inverter, connect the cable that comes from the first inverter and the cable that goes to the next inverter. Repeat these steps for all other inverters in the RS485 chain, except for the last inverter.

- On the last inverter in the RS485 chain, connect the cable that comes from the datalogger to the **right Pin DC+** and **Pin DC-**.



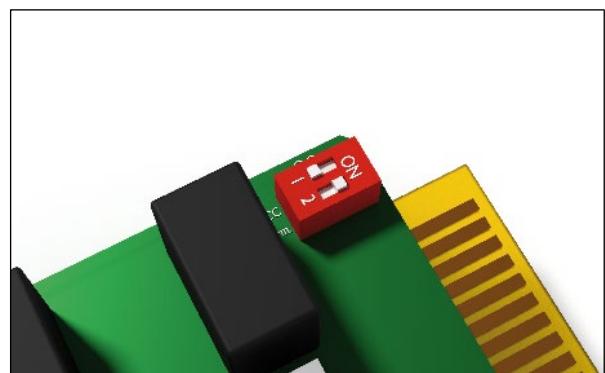
6.8.3 Wiring multiple inverters for RS 485

Wiring RS 485 depends on whether you want to connect a single or multiple inverters.

- On the first inverter in the RS485 chain, connect the cable that comes from the datalogger to the **right Pin DC+** and **Pin DC-**.



- On the last inverter in the RS485 chain, switch on DIP switch 2 to turn on the termination resistor.



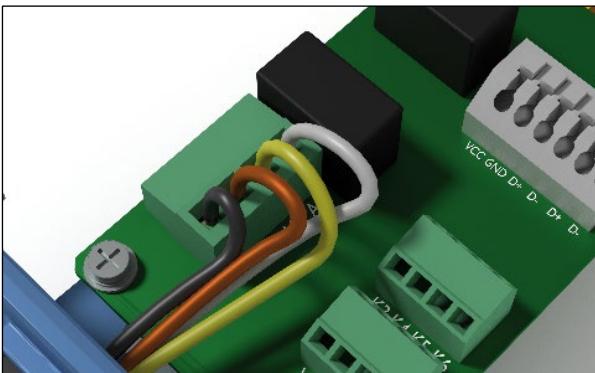
- Connect the cable that goes to the second inverter in the RS485 chain to the **left Pin DC+** and **Pin DC-**.



6 Installation

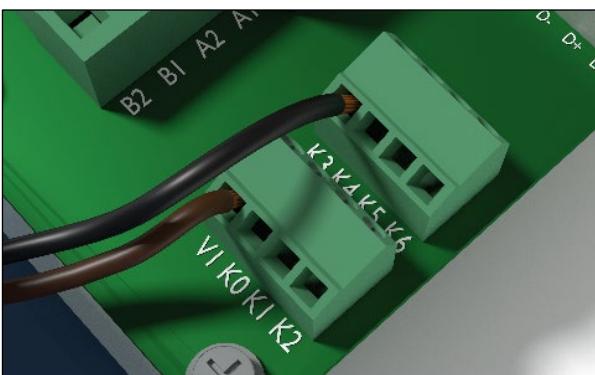
6.8.4 Wiring the dry contacts

1. You can use both dry contacts or only one.

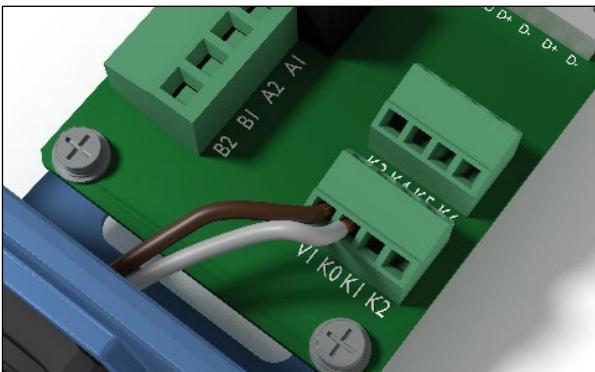


6.8.5 Wiring the digital inputs

1. You can use one of the digital inputs only. The images below are examples. The first image shows the wiring for using the 60% power limitation signal (**Pin V1** and **Pin K3**).



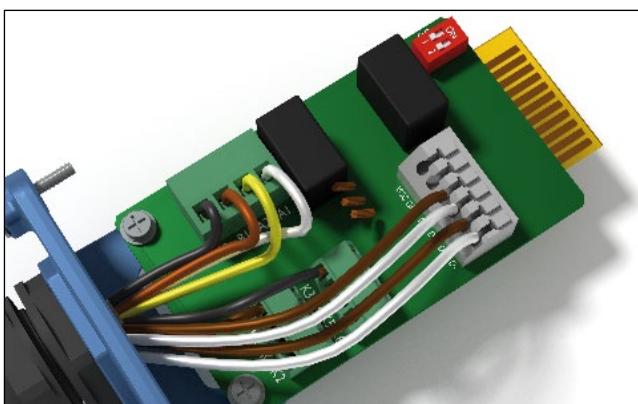
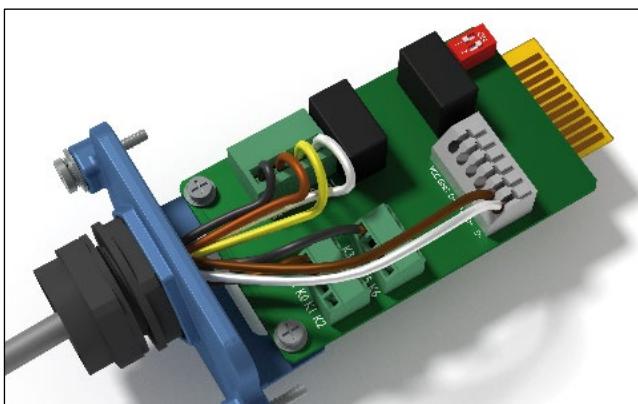
The second image shows the wiring for using EPO (Emergency Power Off, **Pin V1** and **Pin K0**).



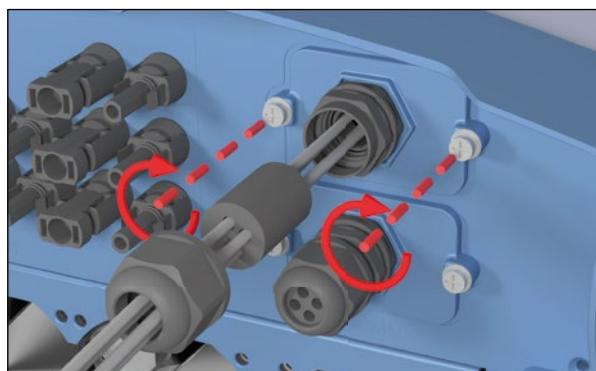
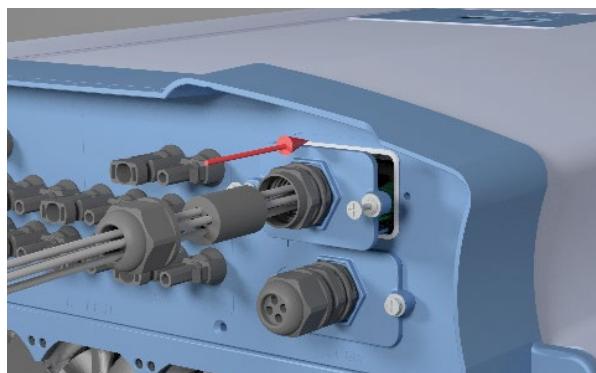
When you want to use multiple digital inputs, **Pin V1** is used for all of these digital inputs.

6.8.6 Finishing the wiring

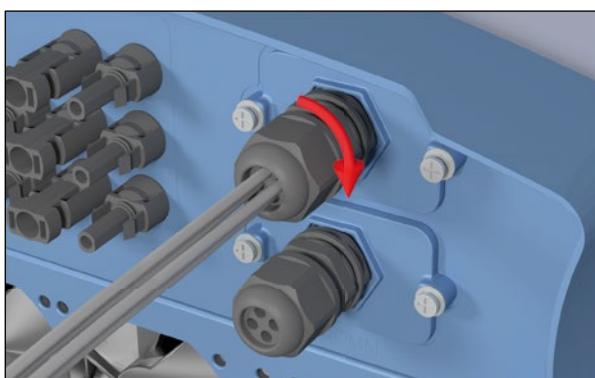
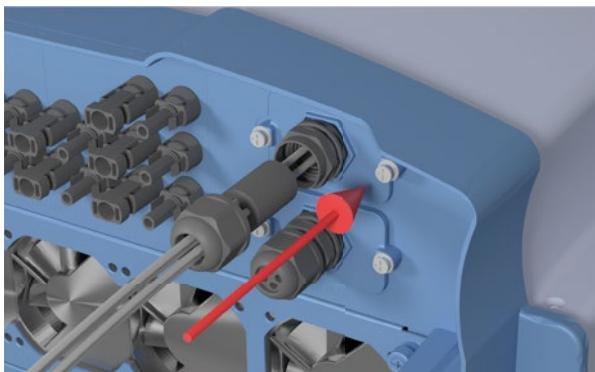
Depending on how many cables you connected and whether it is a single inverter or an inverter in a chain of multiple inverters, the final wiring could look like shown in the following two images.



1. Screw the cover of the communication port onto the inverter.

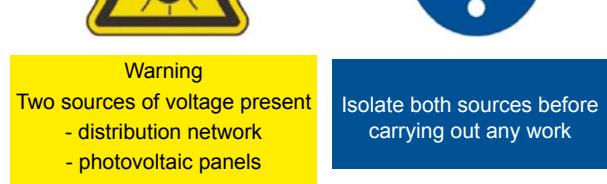
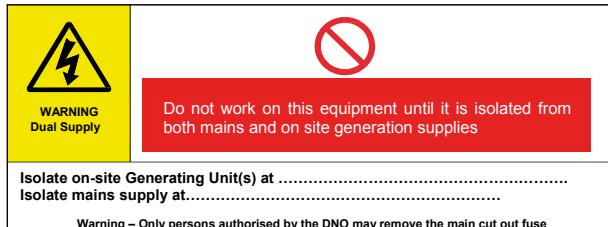


2. Screw the bolting onto the cover.



6.9 Putting labels on the inverter

After finishing the installation, you have to put all necessary labels onto the inverter. Check local regulations about which labels are needed. See some samples below.



7. Commissioning

7. Commissioning

The inverter must be correctly installed, see “[6. Installation](#)”, p. 37.

For information on how the display is operated, see “[4.3 Display, buttons, status LEDs](#)”, p. 12.



To execute commissioning, the inverter needs to be powered either by AC (the grid) or DC (the solar modules).

After powering up the inverter for the first time, the *Select language* dialog is shown.

Select language
→ English
Deutsch
Français

1. Use the buttons and to select language **English**.

To confirm your selection, press the button .

CHINA MV
CZECH
► ENGLAND
FRA - Is 50HZ

2. Use the buttons and to select your country or grid type.

To confirm your selection, press the button .

Are you sure to
set country:
United Kingdom
► YES / NO

3. If the selected country is correct, use the buttons and to select the entry **YES**.

To confirm your selection, press the button .

If you want to change your selection, press the button .

→ The inverter starts a self-test which takes approximately 2 minutes. A countdown shows the remaining time on the display.

- The basic setup is finished. The standard menu is shown.

10.Sep 2014 15:32
Estat: On Grid
Puissance: 0W
E-actuelle: 0 kWh



- Check chapter “[8. Settings](#)”, p. 53 whether you need to adjust additional settings.

8. Settings

8.1 Overview

8.2 Current grid settings (inverter information)	54
8.3 Display language	55
8.4 Date and time	56
8.5 Baud rate for RS485	57
8.6 Inverter ID	58
8.7 Insulation mode and insulation resistance	59
8.8 Grid settings	61
8.9 EPO (External Power Off)	67
8.10 AC Connection type	68
8.11 Max. Power (Maximum feed-in power)	69
8.12 Power limitation	70
8.13 Power versus frequency	72
8.14 Constant cos phi	74
8.15 Cos phi (P)	76
8.16 Constant Q	78
8.17 Q (V) - Apparent power versus voltage	80
8.18 FRT (Fault Ride Through)	83

8 Settings

8.2 Current grid settings (inverter information)

Overview

With this function you can see the current settings of the solar inverter.

Accessing the menu

Main menu > Inverter info.

10.Sep 2014 15:32
Status : On Grid
Power : 0W
E-Today : 0kWh

Meter
Energy Log
Event Log
► Inverter Info.

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Inverter info.**.
To confirm your selection, press the button **ENT**.
3. Use the buttons **▼** and **▲** to scroll through the list.
4. To leave the menu, press the button **ESC**.

8.3 Display language

Overview

With this function you can set the language used in the display.

Accessing the menu

Main menu > General settings > Language

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

►General Settings
Install Settings
Active/Reactive Pwr
FRT

►Language
Date & Time
Baud rate

►English
Deutsch
Français
Italiano

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **General Settings**.
To confirm your selection, press the button **ENT**.
3. Use the buttons **▼** and **▲** to select **Language**.
To confirm your selection, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select a language.
To confirm your selection, press the button **ENT**.

Configurable Parameters

Parameter	Description	Value range
Language	The language used in the display.	—

8 Settings

8.4 Date and time

Overview

With this function you can set date and time.



- For a precise calculation of the statistics in the inverter itself and in a monitoring system, date and time have to be correct.

Accessing the menu

Main menu > General settings > Date & Time

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

►General Settings
Install Settings
Active/Reactive Pwr
FRT

Language
►Date & Time
Baud rate

10.Sep 2014 14:55

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **General Settings**.
To confirm your selection, press the button **ENT**.
3. Use the buttons **▼** and **▲** to select **Date & Time**.
To confirm your selection, press the button **ENT**.
4. Use the buttons **▼** and **▲** to change the currently marked (underlined) value.
When finished, press the button **ENT**.
→ The marking moves to the next value.

Configurable Parameters

Parameter	Description	Value range
-	Date and time	-

8.5 Baud rate for RS485

Overview

With this function you can set the baud rate for the RS485 connection.



- If you connect multiple inverters via RS485, set the same baud rate on each inverter.

Accessing the menu

Main menu > General settings > Baud rate

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

►General Settings
Install Settings
Active/Reactive Pwr
FRT

Language
Date & Time
►Baud rate

►9600
19200
38400

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.

2. Use the buttons **▼** and **▲** to select **General Settings**.

To confirm your selection, press the button **ENT**.

3. Use the buttons **▼** and **▲** to select **Baud rate**.

To confirm your selection, press the button **ENT**.

4. Use the buttons **▼** and **▲** to select a baud rate.

To confirm your selection, press the button **ENT**.

Configurable Parameters

Parameter	Description	Value range
Baud rate	Sets the baud rate for the RS485 connection.	9600 19200 38400

8 Settings

8.6 Inverter ID

Overview

With this function you can set an ID for the inverter. The inverter ID is used to identify the inverter in a RS485 connection. The inverter ID is also used in monitoring systems.



- ▶ Set a different inverter ID for each inverter in the PV plant. Otherwise, the inverters cannot be correctly identified.
- ▶ On the last inverter in the RS485 connection, switch on the RS485 termination resistor. For a description, see “[6.7 Connecting communication port I \(optional\)](#)”, p. 45.

Accessing the menu

Main menu > Install Settings > Inverter ID

10.Sep 2014	15:32
Status:	On Grid
Power:	0W
E-Today:	0kWh

General Settings
► Install Settings
Active/Reactive Pwr
FRT

Warning:
Adj. would affect energy production.
Password 0 * *

► Inverter ID: 001
Insulation
Country
Grid Settings

Setting ID: ID=001

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Install Settings**.
To confirm your selection, press the button **ENT**.
3. The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select **Inverter ID**. The currently set inverter ID is displayed behind the menu entry.
To confirm your selection, press the button **ENT**.
5. Use the buttons **▼** and **▲** to set the inverter ID.
To confirm your setting, press the button **ENT**.

Configurable Parameters

Parameter	Description	Value range
Setting ID	Sets the inverter ID that is needed to identify the inverter when a PV plant contains multiple inverters.	001 .. 254

8.7 Insulation mode and insulation resistance

Description

With this function you can set up the mode of insulation and the insulation resistance.

Accessing the menu

Main menu > Install Settings > Insulation

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
►Install Settings
Active/Reactive Pwr
FRT

Warning: Adj. would affect energy production.
Password 0 * * *

Inverter ID: 001
►Insulation
Country
Grid Settings

►Mode: ON
Resistance: 1200 kΩ

►ON
Plus grounded
Minus grounded
OFF

Mode: ON
►Resistance: 1100 kΩ

150kΩ
►250kΩ
1100kΩ

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Install Settings**.
To confirm your selection, press the button **ENT**.
3. The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select **Insulation**.
To confirm your selection, press the button **ENT**.
5. Use the buttons **▼** and **▲** to select **Mode**. The currently set mode of insulation is displayed behind the menu entry.
To confirm your selection, press the button **ENT**.
6. Use the buttons **▼** and **▲** to select a type of insulation.
To confirm your selection, press the button **ENT**.
7. Use the buttons **▼** and **▲** to select **Resistance**. The currently set value for the insulation resistance is displayed behind the menu entry.
To confirm your selection, press the button **ENT**.
8. Use the buttons **▼** and **▲** to select a value for the insulation resistance.
To confirm your selection, press the button **ENT**.

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

Configurable Parameters

Parameter	Description	Value range
Mode	Mode of insulation	ON
		Plus grounded
		Minus grounded
		OFF
Resistance	Insulation resistance	Default: ON
		150 kΩ 250 kΩ 1100 kΩ
		Default: 1100 kΩ

Do not change this setting without prior consultation with Delta Solar Support.

8.8 Grid settings

8.8.1 Overview



This function is factory-set according to the regulation of each country. The inverter is certified with these settings. The settings should not be changed, unless it is really necessary. Please contact Delta Support when you want to change these settings.



This function is protected by a special password. To get the password, please call the Delta Support hotline in your country. You can find the telephone number on the last page of this document.

To adjust several parameters for the currently selected country/grid settings.

The grid settings section consists of the following subsections:

- Voltage protection (How does the inverter behave in case of overvoltages or undervoltages.)
- Frequency protection (How does the inverter behave in case of overfrequencies or underfrequencies.)
- Reconnection time (The delay time the inverter will wait before it reconnects to the grid after a fault.)
- P Ramp up (Feed-in behavior of the inverter when it reconnects to the grid after a fault.)

8.8.2 Voltage protection

Overview

With this function you can define how the inverter behaves in case of a grid overvoltage and a grid undervoltage.

Accessing the menu

Main menu > Install Settings > Grid settings > Voltage Protection

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
►Install Settings
Active/Reactive Pwr
FRT

Warning:
Adj. would affect energy production.
Password 0 * * *

Inverter ID: 001
Insulation
Country
►Grid Settings

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button until the main menu is displayed.
2. Use the buttons and to select **Install Settings**.
To confirm your selection, press the button .
3. Type in the password you received from Delta Support. Use the buttons and to set each digit.
To confirm a digit, press the button .
4. Use the buttons and to select **Grid settings**.
To confirm your selection, press the button .

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

►	Voltage Protection
	Freq. Protection
	Reconnect T: 600s
	P Ramp up: 6000%/m

5. Use the buttons  and  to select **Voltage protection**.

To confirm your selection, press the button .

►	High Off:	276.0V
	High On:	259.0V
	High Off T:	0.3s
	Low Off:	104.0V

6. If you need to change a parameter, use the buttons  and  to select the parameter.

7. Press the button  to start editing the parameter value.

8. Use the buttons  and  to change the parameter value.

To confirm your setting, press the button  or press the button  to cancel the action.

9. Repeat steps 6 to 8 for the other parameters if you need to change them.

Configurable Parameters

Parameter	Description
High Off	Voltage High Off
High On	Voltage High On
High Off T	Disconnection time for Voltage High Off
Low Off	Voltage Low Off
Low On	Voltage Low On
Low Off T	Disconnection time for Voltage Low Off
Hi Off Slow	Voltage High Off Slow
Hi On Slow	Voltage High On Slow
Hi Off Slow T	Disconnection time for Voltage High Off Slow
Lo Off Slow	Voltage Low Off Slow
Lo On Slow	Voltage Low On Slow
Lo Off Slow T	Disconnection time for Voltage Low Off Slow

Table 8.1.: Configurable parameters for Grid settings > Voltage Protection

Do not change this setting without prior consultation with Delta Solar Support.

8.8.3 Frequency protection

Overview

With this function you can define how the inverter behaves in case of a grid overfrequency and a grid underfrequency.

Accessing the menu

Main menu > Install Settings > Grid settings > Freq. Protection

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
►Install Settings
Active/Reactive Pwr
FRT

Warning:
Adj. would affect energy production.
Password 0 * * *

Inverter ID: 001
Insulation
Country
►Grid Settings

Voltage Protection
►Freq. Protection
Reconnect T: 600s
P Ramp up: 6000%/m

►High Off: 51.50Hz
High On: 50.05Hz
High Off T: 0.1s
Low Off: 47.50Hz

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button  until the main menu is displayed.
 2. Use the buttons  and  to select **Install Settings**.
To confirm your selection, press the button .
 3. Type in the password you received from Delta Support. Use the buttons  and  to set each digit.
To confirm a digit, press the button .
 4. Use the buttons  and  to select **Grid settings**.
To confirm your selection, press the button .
 5. Use the buttons  and  to select **Freq. Protection**.
To confirm your selection, press the button .
 6. Use the buttons  and  to select a parameter.
 7. To start editing the parameter value, press the button .
 8. To change the parameter value, use the buttons  and .
- To confirm your setting, press the button  or press the button  to cancel the action.
9. Repeat steps 6 to 8 for all parameters you want to change.

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

Configurable Parameters

Parameter	Description
High Off	Frequency High Off
High On	Frequency High On
High Off T	Disconnection time for Frequency High Off
Low Off	Frequency Low Off
Low On	Frequency Low On
Low Off T	Disconnection time for Frequency Low Off
Hi Off Slow	Frequency High Off Slow
Hi On Slow	Frequency High On Slow
Hi Off Slow T	Disconnection time for Frequency High Off Slow
Lo Off Slow	Frequency Low Off Slow
Lo On Slow	Frequency Low On Slow
Lo Off Slow T	Disconnection time for Frequency Low Off Slow

Table 8.2.: Configurable parameters for Grid settings > Frequency Protection

Do not change this setting without prior consultation with Delta Solar Support.

8.8.4 Reconnection time

Overview

With this function you can define a reconnection time in case the inverter has disconnected from the grid because of a grid voltage or grid frequency failure (see “8.8.2 Voltage protection”, p. 61 and “8.8.3 Frequency protection”, p. 63). When the failure disappears, the inverter will wait for the set reconnection time before it reconnects to the grid.

Accessing the menu

Main menu > Install Settings > Grid settings > Reconnect T

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0 kWh

General Settings
► Install Settings
Active/Reactive Pwr
FRT

Warning:
Adj. would affect energy production.
Password 0 * * *

Inverter ID: 001
Insulation
Country
► Grid Settings

Voltage Protection
Freq. Protection
► Reconnect T: 600s
P Ramp up: 6000%/m

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Install Settings**.
To confirm your selection, press the button **ENT**.
3. Type in the password you received from Delta Support. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select **Grid settings**.
To confirm your selection, press the button **ENT**.
5. Use the buttons **▼** and **▲** to select **Reconnect T**.
This subsection consists of only one parameter which can be directly edited.
6. To start editing the parameter value, press the button **ENT**.
7. To change the parameter value, use the buttons **▼** and **▲**.
To confirm your setting, press the button **ENT**
To cancel the action, press the button **ESC**.

Configurable Parameters

Parameter	Description
Reconnect T	Reconnection time

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

8.8.5 P Ramp Up

Overview

With this function you can define a ramp for the active power in case the inverter has disconnected from the grid because of a grid voltage or grid frequency failure (see “[8.8.2 Voltage protection](#)”, p. 61 and “[8.8.3 Frequency protection](#)”, p. 63). When the failure disappears, the inverter will continuously increase the active power fed into the grid according to the set ramp.

Accessing the menu

Main menu > Install Settings > Grid settings > P Ramp Up

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
► Install Settings
Active/Reactive Pwr
FRT

Warning: Adj. would affect energy production.
Password 0 * * *

Inverter ID: 001
Insulation
Country
► Grid Settings

Voltage Protection
Freq. Protection
Reconnect T: 600s
► P Ramp up: 6000%/m

- When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.

- Use the buttons **▼** and **▲** to select **Install Settings**.

To confirm your selection, press the button **ENT**.

- Type in the password you received from Delta Support. Use the buttons **▼** and **▲** to set each digit.

To confirm a digit, press the button **ENT**.

- Use the buttons **▼** and **▲** to select **Grid settings**.

To confirm your selection, press the button **ENT**.

- Use the buttons **▼** and **▲** to select **P Ramp Up**.

This subsection consists of only one parameter which can be directly edited.

- To start editing the parameter value, press the button **ENT**.

- To change the parameter value, use the buttons **▼** and **▲**.

To confirm your setting, press the button **ENT**.

To cancel the action, press the button **ESC**.

Configurable Parameters

Parameter	Description
P Ramp up	

Do not change this setting without prior consultation with Delta Solar Support.

8.9 EPO (External Power Off)

Overview

With this function you can set the type of contact for the EPO function (normally open or normally closed).

Accessing the menu

Main menu > Install Settings > EPO

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
►Install Settings
Active/Reactive Pwr
FRT

Warning: Adj. would affect energy production.
Password 0 * * *

DC Injection
Dry Contact
RCMU: ON
►EPO: Normal Close

- When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
- Use the buttons **▼** and **▲** to select **Install Settings**.
To confirm your selection, press the button **ENT**.
- The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.
- Use the buttons **▼** and **▲** to select **EPO**. The current setting is displayed behind the menu entry.
- To start editing the parameter value, press the button **ENT**.
- To change the parameter value, use the buttons **▼** and **▲**.
To confirm your selection, press the button **ENT**
To cancel the action, press the button **ESC**.

Configurable Parameters

Parameter	Description	Value range
EPO	Sets the type of contact for the relais (normally closed or normally open).	Normal Open Normal Close Default setting: Normal Close

8 Settings

8.10 AC Connection type

Overview

With this function you can set the type of AC connection you use to connect the inverter to the grid. The inverter can be connected to a 3-wire system (3P3W: L1, L2, L3, PE) or a 4-wire system (3P4W: L1, L2, L3, N, PE). The default setting is 3P4W.

Accessing the menu

Main menu > Install Settings > AC Connection

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
►Install Settings
Active/Reactive Pwr
FRT

Warning: Adj. would affect energy production.
Password 0 * * *

►AC Connection: 3P4W
Anti-islanding: ON
Max. Power: 100%
Return to Factory

- When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.

- Use the buttons **▼** and **▲** to select **Install Settings**.

To confirm your selection, press the button **ENT**.

- The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.

To confirm a digit, press the button **ENT**.

- Use the buttons **▼** and **▲** to select **AC Connection**. The current setting is displayed behind the menu entry.

- To start editing the parameter value, press the button **ENT**.

- To change the parameter value, use the buttons **▼** and **▲**.

To confirm your selection, press the button **ENT**.

To cancel the action, press the button **ESC**.

Configurable Parameters

Parameter	Description	Value range
AC Connection	Sets the type of AC connection used to connect the inverter to the grid. 3P3W: 3-wire system (L1, L2, L3, PE) 3P4W: 4-wire system (L1, L2, L3, N, PE)	3P3W 3P4W

8.11 Max. Power (Maximum feed-in power)

Overview



This function should be set only when requested by country regulations, authorities or your grid operator.

With this function you can limit the maximum active power to be fed into the grid.

Accessing the menu

Main menu > Install Settings > Max. Power

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
►Install Settings
Active/Reactive Pwr
FRT

Warning:
Adj. would affect energy production.
Password 0 * * *

AC Connection: 3P4W
Anti-islanding: ON
►Max. Power: 5000VA
Return to Factory

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Install Settings**.
To confirm your selection, press the button **ENT**.
3. The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select **Max. Power**. The current setting is displayed behind the menu entry.
5. To start editing the parameter value, press the button **ENT**.
6. To change the parameter value, use the buttons **▼** and **▲**.
To confirm your selection, press the button **ENT**.
To cancel the action, press the button **ESC**.

Configurable Parameters

Parameter	Description	Value range
Max. Power	Limits the maximum power to be fed into the grid. Default: according to the country regulations	0 .. 55000 VA

8 Settings

8.12 Power limitation

Overview



Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can limit the active power fed into the grid.

The power limitation set with this function relates to the value set for the **Max. Power** parameter in the installation settings. For a description of the **Max. Power** parameter, see “[8.11 Max. Power \(Maximum feed-in power\)](#)”, p. 69.

Example

You have set the maximum power to 80%.

If you additionally set a power limitation of 70%, the total maximum active power is calculated as
 $50 \text{ kW} \times 80\% \times 70\% = 28 \text{ kW}$.

Accessing the menu

Main menu > Active/Reactive Pwr > Active Power Ctrl > Power limit

10.Sep 2014 15:32
Status : On Grid
Power : 0W
E-Today : 0kWh

General Settings
Install Settings
►Active/Reactive Pwr
FRT

Warning :
Adj. would affect energy production.
Password 0 * * *

►Active Power Ctrl
Reactive Power Ctrl

►Power Limit
Power vs. Frequency
P(V)

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Active/Reactive Pwr**.
To confirm your selection, press the button **ENT**.
3. The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select **Active Power Ctrl**.
To confirm your selection, press the button **ENT**.
5. Use the buttons **▼** and **▲** to select **Power Limit**.
To confirm your selection, press the button **ENT**.

Do not change this setting without prior consultation with Delta Solar Support.

►Mode:	ON
Set Point:	100%

6. To change the mode, use the buttons  and  and press the button .

To switch the function **on**, select **ON** and press the button .

To switch the function **off**, select **OFF** and press the button . When you switch the function off, you can ignore the following steps.

Mode:	ON
►Set Point:	100%

7. To set the value for the power limitation, use the buttons  and  to select **Set Point** and press the button .

8. Use the buttons  and  To change the parameter value.

To confirm your setting, press the button .

To cancel the action, press the button .

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	ON OFF Default value: OFF
Set Point	The value for the power limitation.	0 .. 100% Default value: 100%

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

8.13 Power versus frequency

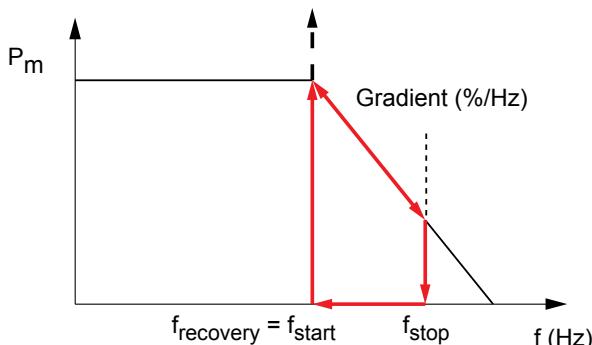
Overview



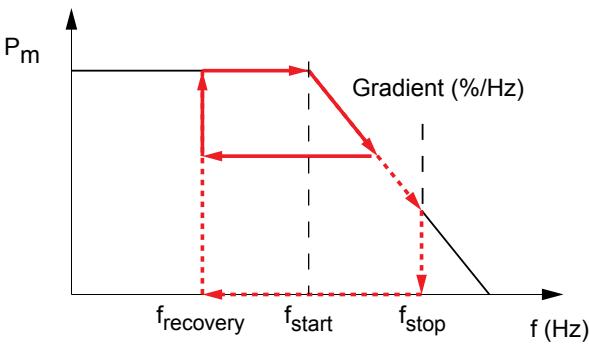
Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can control the active power as a function of the grid frequency.

Default behaviour for Germany LV (VDE-AR-N 4105)



Default behavior for grid Germany MV (BDEW)



f_{stop} is automatically calculated according to the following formula:

$$f_{stop} = f_{start} + (1 / \text{Gradient})$$

Accessing the menu

Main menu > Active/Reactive Pwr > Active Power Ctrl > Power vs. Frequency

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
Install Settings
►Active/Reactive Pwr
FRT

Warning:
Adj. would affect energy production.
Password 0 * * *

►Active Power Ctrl
Reactive Power Ctrl

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Active/Reactive Pwr**. To confirm your selection, press the button **ENT**.
3. The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit. To confirm a digit, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select **Active Power Ctrl**. The current setting is displayed behind the menu entry.

Do not change this setting without prior consultation with Delta Solar Support.

Power Limit
► Power vs. Frequency P(V)

5. Use the buttons  and  to select **Power vs Frequency**. The current setting is displayed behind the menu entry.

► Mode:	ON
F Start:	50.20Hz
F Recovery:	50.20Hz
Gradient:	100%

6. To change the mode, use the buttons  and  and press the button .

To switch the function **on**, select **ON** and press the button .

To switch the function **off**, select **OFF** and press the button . When you switch the function off, you can ignore the following steps.

Mode:	ON
► F Start:	50.20Hz
F Recovery:	50.20Hz
Gradient:	100%

7. Use the buttons  and  to select a parameter and press the button .

8. To change the parameter value, use the buttons  and .

To confirm your setting, press the button .

To cancel the action, press the button .

9. Repeat steps 7 to 8 for all parameters you want to change.

Configurable Parameters

Parameter	Description
Mode	Switches the function on and off.
F Start	The grid frequency at which the inverter starts to limit the active power according to the Gradient parameter.
F Recovery	The grid frequency at which the inverter reconnects to the grid or at which the inverter feeds-in full power again. The behavior depends on the selected country and grid.
Gradient	Adjustment of the active power fed into the grid in percent per Hz when the grid frequency is between F Start and F Stop.
T Recovery	When the grid frequency drops to F Recovery, the inverter will wait for the time defined in T Recovery before it returns to normal operating behavior.

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

8.14 Constant cos phi

Overview

With this function you can set a constant cos phi ($\cos \varphi$).



This function should be set only when requested by country regulations, authorities or your grid operator.

Accessing the menu

Main menu > Active/Reactive Pwr > Reactive Power Ctrl > Constant cos phi

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
Install Settings
►Active/Reactive Pwr
FRT

Warning: Adj. would affect energy production.
Password 0 * * *

Active Power Ctrl
►Reactive Power Ctrl

►Constant cos phi
Cos phi (P)
Constant Q
Q(V)

►Mode: ON
Cos phi: Ind 1.00

Mode: ON
►Cos phi: Ind 1.00

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Active/Reactive Pwr**.
To confirm your selection, press the button **ENT**.
3. The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select **Reactive Power Ctrl**. The current setting is displayed behind the menu entry.
5. Use the buttons **▼** and **▲** to select **Constant cos phi**. The current setting is displayed behind the menu entry.
6. To change the mode, use the buttons **▼** and **▲** to select **Mode** and press the button **ENT**.
To switch the function **on**, select **ON** and press the button **ENT**.
To switch the function **off**, select **OFF** and press the button **ENT**. When you switch the function off, you can ignore the following steps.
7. If you need to change the cos phi ($\cos \varphi$), use the buttons **▼** and **▲** to select **Cos phi** and press the button **ENT**

Do not change this setting without prior consultation with Delta Solar Support.

8. To change the parameter value, use the buttons  and .

To confirm your setting, press the button .

To cancel the action, press the button .

Configurable Parameters

Parameter	Description	Value range
Mode	Switches the function on and off.	ON OFF Default value: OFF
Cos phi	Sets up a cos phi so that the inverter can feed reactive power into the grid.	ind 0.8 ... cap 0.8

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

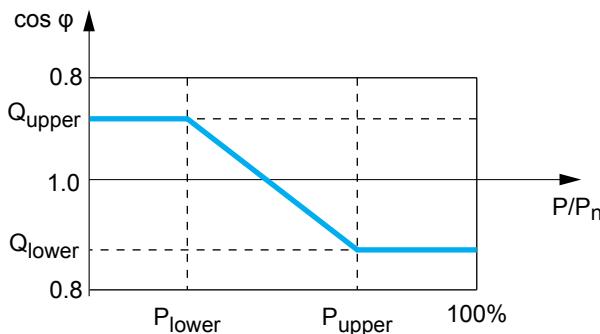
8.15 Cos phi (P)

Overview



Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can set the cos phi ($\cos \phi$) as a function of the active power.



Accessing the menu

Main menu > Active/Reactive Pwr > Active Power Ctrl > Cos phi (P)

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
Install Settings
►Active/Reactive Pwr
FRT

Warning:
Adj. would affect energy production.
Password 0 * *

Active Power Ctrl
►Reactive Power Ctrl

Constant cos phi
►Cos phi (P)
Constant Q
Q(V)

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.

2. Use the buttons **▼** and **▲** to select **Active/Reactive Pwr**.

To confirm your selection, press the button **ENT**.

3. The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.

To confirm a digit, press the button **ENT**.

4. Use the buttons **▼** and **▲** to select **Reactive Power Ctrl**. The current setting is displayed behind the menu entry.

5. Use the buttons **▼** and **▲** to select **Cos phi (P)**. The current setting is displayed behind the menu entry.

Do not change this setting without prior consultation with Delta Solar Support.

►Mode:	ON
Q upper:	Ind 1.00
P lower:	45%
Q lower:	Ind 1.00

6. To change the mode, use the buttons  and  to select **Mode** and press the button .

To switch the function **on**, select **ON** and press the button .

To switch the function **off**, select **OFF** and press the button .

Mode:	ON
►Q upper:	Ind 1.00
P lower:	45%
Q lower:	Ind 1.00

7. If you need to change a parameter, use the buttons  and  to select the parameter and press the button .

8. To change the parameter value, use the buttons  and .

To confirm your setting, press the button .

To cancel the action, press the button .

9. Repeat steps 7 to 8 for other parameters if you need to change them.

Configurable Parameters

Parameter	Description
Mode	Switches the function on and off.
Q upper	Sets up the upper limit for the reactive power which is set as a cos phi (cos φ).
P upper	Sets up the upper limit for the active power which is set in per cent of the nominal power.
Q lower	Sets up the lower limit for the reactive power which is set as a cos phi (cos φ).
P lower	Sets up the lower limit for the active power which is set in per cent of the nominal power.
V lock-in	The lower limit of the grid voltage range in which the function is active. The parameter is used for Italy only.
V lock-out	The upper limit of the grid voltage range in which the function is active. The parameter is used for Italy only.

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

8.16 Constant Q

Overview

With this function you can set a constant reactive power.



This function should be set only when requested by country regulations, authorities or your grid operator.

Accessing the menu

Main menu > Active/Reactive Pwr > Active Power Ctrl > Constant Q

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
Install Settings
►Active/Reactive Pwr
FRT

Warning:
Adj. would affect energy production.
Password 0 * * *

Active Power Ctrl
►Reactive Power Ctrl

Constant cos phi
Cos phi (P)
►Constant Q
Q(V)

►Mode: ON
Fix Q: Ind 90%

Mode: ON
►Fix Q: Ind 90%

- When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.

- Use the buttons **▼** and **▲** to select **Active/Reactive Pwr**. To confirm your selection, press the button **ENT**.

- The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit. To confirm a digit, press the button **ENT**.

- Use the buttons **▼** and **▲** to select **Reactive Power Ctrl**. The current setting is displayed behind the menu entry.

- Use the buttons **▼** and **▲** to select **Constant Q**. The current setting is displayed behind the menu entry.

- To change the mode, use the buttons **▼** and **▲** to select **Mode** and press the button **ENT**.

To switch the function **on**, select **ON** and press the button **ENT**.

To switch the function **off**, select **OFF** and press the button **ENT**. When you switch the function off, you can ignore the following steps.

- If you need to change the parameter **Fix Q**, use the buttons **▼** and **▲** to select the parameter and press the button **ENT**.

Do not change this setting without prior consultation with Delta Solar Support.

8. To change the parameter value, use the buttons  and .

To confirm your setting, press the button .

To cancel the action, press the button .

9. Repeat steps 7 to 8 for other parameters if you need to change them.

Configurable Parameters

Parameter	Description
Mode	Switches the function on and off.
Fix Q	Sets up a constant reactive power which is set in per cent of the nominal apparent power S_n .

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

8.17 Q (V) - Apparent power versus voltage

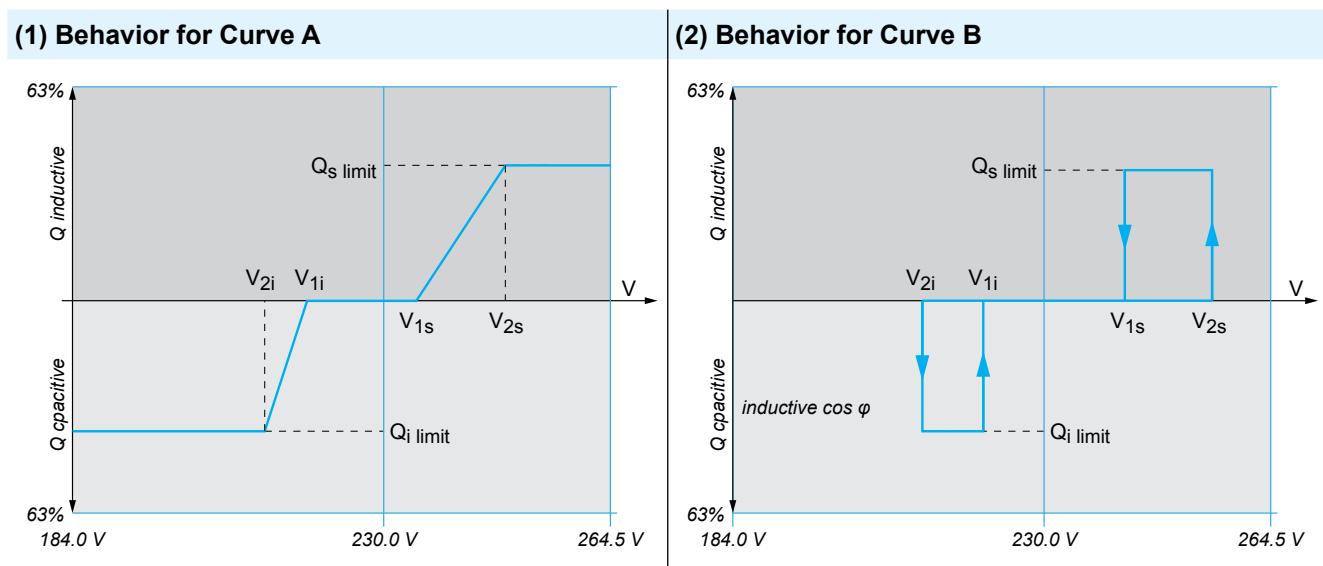
Overview



Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can set the apparent power as a function of the grid voltage.

This function is available for medium voltage grids only.



Operating behavior for curve A

When the grid voltage increases to the lower voltage limit $V1s$, the inverter starts to feed-in inductive reactive power. When you set the parameter **T inductive**, the inverter will wait for this period time for the grid voltage falling back to a level below $V1s$ before it starts feeding in inductive reactive power. When the grid voltage continues to increase, the inductive reactive power will be increased according to the ramp defined by the curve. If the grid voltage exceeds the upper voltage limit $V2s$, the inductive active power remains at the level defined in **Qs limit**.

When the grid voltage falls to the upper voltage limit $V1i$, the inverter starts to feed-in inductive reactive power. When you set the parameter **T delay**, the inverter will wait for this period time for the grid voltage rising back to a level above $V1i$ before it starts feeding in inductive reactive power. When the grid voltage continues to fall, the inductive reactive power will be increased according to the ramp defined by the curve. If the grid voltage exceeds the upper voltage limit $V2i$, the inductive active power remains at the level defined in **Qi limit**.

Do not change this setting without prior consultation with Delta Solar Support.

Accessing the menu

Main menu > Active/Reactive Pwr > Active Power Ctrl > Q (V)

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

General Settings
Install Settings
►Active/Reactive Pwr
FRT

Warning: Adj. would affect energy production.
Password 0 * * *

Active Power Ctrl
►Reactive Power Ctrl

Constant cos phi
Cos phi (P)
Constant Q
►Q(V)

►Mode:	OFF
V1s:	248.4V
V2s:	253.0V
Qs limit:	Ind 44%

Mode:	Curve A
►V1s:	248.4V
V2s:	253.0V
Qs limit:	Ind 44%

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
2. Use the buttons **▼** and **▲** to select **Active/Reactive Pwr**.
To confirm your selection, press the button **ENT**.
3. The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.
4. Use the buttons **▼** and **▲** to select **Reactive Power Ctrl**. The current setting is displayed behind the menu entry.
5. Use the buttons **▼** and **▲** to select **Q (V)**. The current setting is displayed behind the menu entry.
6. To change the mode, use the buttons **▼** and **▲** to select **Mode** and press the button **ENT**.
To switch the function **on**, select a mode and press the button **ENT**.
To switch the function **off**, select **OFF** and press the button **ENT**. When you switch the function off, you can ignore the following steps.
7. If you need to change a parameter, use the buttons **▼** and **▲** to select the parameter and press the button **ENT**.
8. To change the parameter value, use the buttons **▼** and **▲**.
To confirm your setting, press the button **ENT**.
To cancel the action, press the button **ESC**.
9. Repeat steps 7 to 8 for other parameters if you need to change them.

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

Configurable Parameters

Parameter	Description
Mode	OFF Switches the function on and off. Curve A Curve B
V1s	The lower voltage limit for feeding-in capacitive reactive power.
V2s	The upper voltage limit for feeding-in capacitive reactive power.
Qs_limit	The limit for the inductive apparent power. The value is set in per cent of the rated apparent power S_n . This value is with parameter V2s.
V1i	The upper voltage limit for feeding-in inductive reactive power.
V2i	The upper voltage limit for feeding-in inductive reactive power.
Qi_limit	The limit for the inductive apparent power. The value is set in per cent of the rated apparent power S_n . This value is with parameter V2s.
T_delay	Internal parameter
P_lock-in	The lower limit of the active power range within which the function is active. The parameter is given in percent of the nominal power. Used for Italy only.
P_lock-out	The upper limit of the active power range within which the function is active. The parameter is given in percent of the nominal power. Used for Italy only.

Do not change this setting without prior consultation with Delta Solar Support.

8.18 FRT (Fault Ride Through)

Overview



Values have been set based upon country standards. If you modify these values, you will lose certification. Therefore you should set this function only when requested by country regulations, authorities or your grid operator.

With this function you can set the operation behavior of the inverter for FRT (Fault Ride Through).

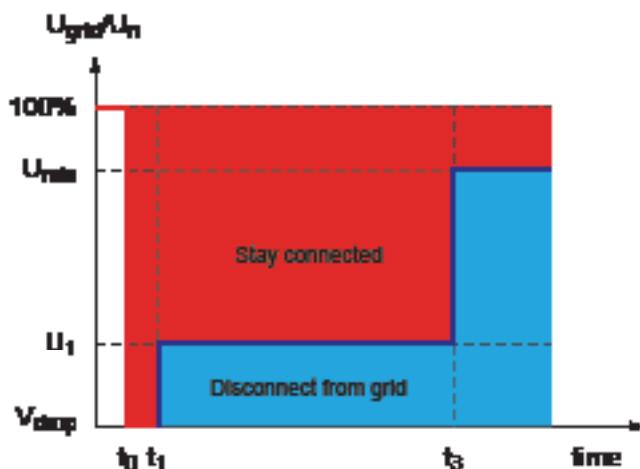


Fig. 8.28: Operation behavior for FRT (Fault Ride Through)

t_1 : The point in time when the fault occurs.

Accessing the menu

Main menu > FRT

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0 kWh

General Settings
Install Settings
Active/Reactive Pwr
► FRT

Warning:
Adj. would affect energy production.
Password 0 * * *

- When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.
- Use the buttons **▼** and **▲** to select **FRT**.
To confirm your selection, press the button **ENT**.
- The menu is protected by password 5555. Use the buttons **▼** and **▲** to set each digit.
To confirm a digit, press the button **ENT**.

Do not change this setting without prior consultation with Delta Solar Support.

8 Settings

►Mode:	ON
Dead band:	-10%
Vdrop:	0%
t1:	0.30s

4. To change the mode, use the buttons  and  to select **Mode** and press the button .

To switch the function **on**, select **Mode = ON** and press the button .

To switch the function **off**, select **Mode = OFF** and press the button . When you switch the function off, you can ignore the following steps.

Mode:	ON
►Dead band:	-10%
Vdrop:	0%
t1:	0.30s

5. If you need to change a parameter, use the buttons  and  to select the parameter and press the button .

6. To change the parameter value, use the buttons  and .

To confirm your setting, press the button .

To cancel the action, press the button .

7. Repeat steps 5 to 6 for all parameters you need to change.

Configurable Parameters

Parameter	Description
Mode	Switches the function on and off.
Dead band	Dead band
Vdrop	Drop voltage
t1	Time t1
U1	Voltage U1
t3	Time t3
K factor	K factor

Do not change this setting without prior consultation with Delta Solar Support.

9. Measurements and statistics

The inverter provides several measurements and statistics about the operating behavior and events that can have an influence on the operating behavior.

The following types of measurements and statistics are available:

Type of information	Description
Meter	Current data of many parameters.
Energy log	Energy information for total lifetime.
Event log	A list of important events like failures, parameter changes etc. with date and time.
Inverter information	Basic information like general settings, software versions etc.

9.1 Meter

Description

In this menu you find the current data of several parameters in real time. The meter statistics consist of three pages. The information can only be read and not edited.

Accessing the Menu

Main menu > Meter

10 . Sep 2014 15:32
Status : On Grid
Power : 0W
E - Today : 0 kWh

- When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button  until the main menu is displayed.

►Meter
Energy Log
Event Log
Inverter Info.

- Use the buttons  and  to select **Meter**.

To confirm your selection, press the button .

AC	L 1	L 2	L 3
V	0	0	0 V
I	0	0	0 A
P	0	0	0 W

- Use the buttons  and  to scroll through the meter statistics.

AC
Power : 0 W
Frequency : 0 Hz
E - Today : 0 kWh

DC	DC1	DC2
V	0	0 V
I	0	0 A
P	0	0 W

- To close the meter statistics, press the button .

9 Measurements and statistics

Displayed Parameters

Parameter	Description
Page 1	AC side
	For the AC side in total is displayed:
Power	Currently produced active power, in W.
Frequency	Current grid frequency, in Hz.
E-Today	Total energy produced on this day, in kWh.
Page 2	AC side
	For each phase (L1, L2, L3) is displayed:
V	Voltage, in V
I	Current, in A
P	Active Power, in W
Page 3	DC side
	For each DC input is displayed:
V	Voltage, in V
I	Current, in A
P	Power, in W

9.2 Energy log

Description

In these statistics you find several values for the total lifetime of the solar inverter.

Accessing the Menu

Main menu > Energy log

10.Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

- When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button **ESC** until the main menu is displayed.

Meter
►Energy Log
Event Log
Inverter Info.

- Use the buttons **▼** and **▲** to select **Energy log**.

To confirm your selection, press the button **ENT**.

Energy log
Life energy: 0kWh
Runtime: 0h

- To close the energy log, press the button **ESC**.

Displayed Parameters

Parameter	Description
Life energy	Total amount of energy produced by the solar inverter, in kWh.
Runtime	The total time that the inverter was in operation.

9 Measurements and statistics

9.3 Event log

Description

The event log is a list of important events that happened during operation.

Accessing the Menu

Main menu > Event log

10.Sep 2014 15:32
Status : On Grid
Power : 0W
E-Today : 0kWh

Meter
Energy Log
►Event Log
Inverter Info.

1. When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button  until the main menu is displayed.
2. Use the buttons  and  to select **Event log**.
To confirm your selection, press the button .
3. Use the buttons  and  to scroll through the event log.

9.4 Inverter information

Description

In this section you find general information about the inverter.

Accessing the Menu

Main menu > Event log

10. Sep 2014 15:32
Status: On Grid
Power: 0W
E-Today: 0kWh

- When the default information is displayed, press any button to open the main menu. Otherwise, repeatedly press the button  until the main menu is displayed.

Meter
Energy Log
Event Log
► Inverter Info.

- Use the buttons  and  to select **Inverter Info.**

To confirm your selection, press the button .

Meter
Energy Log
Event Log
► Inverter Info.

- Use the buttons  and  to scroll through the inverter information.

Displayed Parameters

Parameter	Description
S/N	Serial number.
DSP, Red, Comm, Wifi	The software versions of the various controllers.
ID	The currently set inverter ID for RS485. For a description how to change the inverter ID, see " 8.6 Inverter ID ", p. 58.
Country	The currently set country/grid.
Insulation	The currently set insulation resistance in kΩ. For a description how to change the insulation settings, see " 8.7 Insulation mode and insulation resistance ", p. 59.
Baud rate	The currently set baud rate for RS485. For a description how to change the baud rate, see " 8.5 Baud rate for RS485 ", p. 57.
Install	The date of installation.
AC connection	The currently chosen type of AC connection. For a description how to set a different type of AC connection, see " 8.11 AC Connection type ", p. 68.
Pmax	The currently set maximum active power that the inverter feeds into the grid. For a description how to change the maximum active power, see " 8.12 Max. Power (Maximum feed-in power) ", p. 69.

10. Error messages and trouble shooting

10. Error messages and trouble shooting

10.1 Errors

Message	Possible cause	Solution
AC Freq Low	Actual utility frequency is under the UFR (under frequency recognition) setting.	Check the utility frequency on solar inverter terminal.
	Incorrect country or grid setting.	Check country and grid setting.
	Detection circuit malfunction.	Check the detection circuit inside solar inverter.
AC Freq High	Actual utility frequency is over the OFR (over frequency recognition) setting.	Check the utility frequency on solar inverter terminal.
	Incorrect country setting.	Check country setting.
	Detection circuit malfunction.	Check the detection circuit inside solar inverter.
AC Volt High	Actual utility voltage is over the OVR (over voltage recognition) setting.	Check the utility voltage on solar inverter terminal.
	Utility voltage is over the Slow OVR setting during operation.	Check the utility voltage on solar inverter terminal.
	Incorrect country or grid setting.	Check country and grid setting.
	Detection circuit malfunction.	Check the detection circuit inside solar inverter.
AC Volt Low	Actual utility voltage is under the UVR (under voltage recognition) setting.	Check the utility voltage connection to solar inverter terminal.
	Incorrect country or grid setting.	Check country and grid setting.
	Wrong connections in AC plug.	Check the connection in AC plug.
	Detection circuit malfunction.	Check the detection circuit inside solar inverter.
Grid Quality	Non-linear load in grid and near to inverter.	Grid connection of inverter needs to be far away from non-linear load if necessary.
HW Connect Fail	Wrong connection in AC plug.	Check the AC connection.
	Detection circuit malfunction.	Check the detection circuit inside solar inverter.
Insulation	PV array insulation fault.	Check the insulation of Solar inputs.
	Large PV array capacitance between Plus to Ground or Minus to Ground or both.	Check the capacitance, dry PV panel if necessary.
	Detection circuit malfunction.	Check the detection circuit inside solar inverter.
No Grid	AC breaker is OFF.	Switch on AC breaker.
	Disconnect in AC plug.	Check the connection in AC plug and make sure it connects to inverter.

10. Error messages and trouble shooting

Message	Possible cause	Solution
Solar1 High	<ul style="list-style-type: none"> ● Actual Solar1 voltage is over 1000 V_{DC}. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Modify the solar array setting, and make the Voc less than 1000 V_{DC}. ● Check the detection circuit inside solar inverter.
Solar2 High	<ul style="list-style-type: none"> ● Actual Solar2 voltage is over 1000 V_{DC}. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Modify the solar array setting, and make V_{DC} less than 1000 V_{DC}. ● Check the detection circuit inside solar inverter.

EN

10.2 Warnings

Message	Possible cause	Solution
Solar1 Low	<ul style="list-style-type: none"> ● Actual Solar1 voltage is under the limit. ● Some devices were damaged inside solar inverter if the actual Solar1 voltage is close to “0”. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Check the Solar1 voltage connection to solar inverter terminal. ● Check all switching devices in boost1. ● Check the detection circuit inside solar inverter.
Solar2 Low	<ul style="list-style-type: none"> ● Actual Solar2 voltage is under the limit. ● Some devices were damaged inside solar inverter if the actual Solar2 voltage is close to “0”. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Check the Solar2 voltage connection to solar inverter terminal. ● Check all switching devices in boost2. ● Check the detection circuit inside solar inverter.

10.3 Faults

Message	Possible cause	Solution
AC Current High	<ul style="list-style-type: none"> ● Surge occurs during operation. ● Driver for inverter stage is defective. ● Switching device is defective. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Call Delta Support. ● Check the driver circuit in inverter stage. ● Check all switching devices in inverter stage. ● Check the detection circuit inside solar inverter.
Bus Unbalance	<ul style="list-style-type: none"> ● Not totally independent or parallel between inputs. ● PV array short to ground. ● Driver for boost is defective or disconnected. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Check the inputs connections. ● Check the PV array insulation. ● Check the driver circuit for boost inside solar inverter. ● Check the detection circuit inside solar inverter.

10. Error messages and trouble shooting

Message	Possible cause	Solution
DC Current High	<ul style="list-style-type: none"> Switching device in boost is defective. Driver for boost is defective. Input current detection circuit malfunction. 	<ul style="list-style-type: none"> Check all switching device in boost. Check the driver circuit for boost inside the solar inverter. Check input current detection circuit.
Ground Current	<ul style="list-style-type: none"> PV array insulation fault. Large PV array capacitance between Plus to Ground or Minus to Ground. Either side of boost driver or boost choke malfunction. Detection circuit malfunction. 	<ul style="list-style-type: none"> Check the insulation of DC inputs. Check the capacitance (+ <-> GND & - <->GND), must < 2.5 μF. Install a external transformer if necessary. Check boost driver & boost choke. Check the detection circuit inside solar inverter.
HW AC OCR	<ul style="list-style-type: none"> Large grid harmonics. Switching device is defective. Detection circuit malfunction. 	<ul style="list-style-type: none"> Check the utility waveform. Grid connection of inverter needs to be far away from non-linear load if necessary. Check all switching devices in inverter stage. Check the detection circuit inside the solar inverter.
HW Bus OVR	<ul style="list-style-type: none"> Driver for boost is defective. Voc of PV array is > 1000 V_{DC}. Surge occurs during operation. Detection circuit malfunction. 	<ul style="list-style-type: none"> Check the driver circuit for boost inside solar inverter. Modify the solar array setting, and make V_{DC} less than 1000 V_{DC}. Call Delta Support. Check the detection circuit inside solar inverter.
HW COMM1	<ul style="list-style-type: none"> DSP is idling. The communication connection is disconnected. The communication circuit malfunction. 	<ul style="list-style-type: none"> Check reset and crystal in DSP. Check the connection between DSP and COMM. Check the communication circuit.
HW COMM2	<ul style="list-style-type: none"> Red. CPU is idling. The communication connection is disconnected. 	<ul style="list-style-type: none"> Check reset and crystal in Red. CPU. Check the connection between Red. CPU and DSP.
HW Connect Fail	<ul style="list-style-type: none"> Power line is disconnected inside solar inverter. Current feedback circuit is defective. 	<ul style="list-style-type: none"> Check the power lines inside solar inverter. Check the current feedback circuit inside solar inverter.

10. Error messages and trouble shooting

Message	Possible cause	Solution
HW CT A Fail	<ul style="list-style-type: none"> ● Test current loop is broken. ● CTP3 is defective. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Check the connection of CNP4 to CNM4. ● Replace CTP3 with new one. ● Check the detection circuit inside the solar inverter.
HW CT B Fail	<ul style="list-style-type: none"> ● Test current loop is broken. ● CTP4 is defective. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Check the connection of CNP4 to CNM4. ● Replace CTP4 with new one. ● Check the detection circuit inside the solar inverter.
HW CT C Fail	<ul style="list-style-type: none"> ● Test current loop is broken. ● CTP5 is defective. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Check the connection of CNP4 to CNM4. ● Replace CTP5 with new one. ● Check the detection circuit inside the solar inverter.
HW DC Injection	<ul style="list-style-type: none"> ● Utility waveform is abnormal. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Check the utility waveform. Grid connection of inverter needs to be far away from non-linear load if necessary. ● Check the detection circuit inside solar inverter.
HW DSP ADC1 HW DSP ADC2 HW DSP ADC3	<ul style="list-style-type: none"> ● Insufficient input power. ● Auxiliary power circuitry malfunction. ● Detection circuit malfunction. 	<ul style="list-style-type: none"> ● Check the input voltage, must > 150 V_{DC}. ● Check the auxiliary circuitry inside the solar inverter. ● Check the detection circuit inside the solar inverter.

EN

10. Error messages and trouble shooting

Message	Possible cause	Solution
HW Efficiency	<ul style="list-style-type: none"> The calibration is incorrect. Current feedback circuit is defective. 	<ul style="list-style-type: none"> Check the accuracy of current and power. Check the current feedback circuit inside solar inverter.
HW NTC1 Fail HW NTC2 Fail HW NTC3 Fail HW NTC4 Fail	<ul style="list-style-type: none"> Ambient temperature > 90 °C or < -30 °C. Detection circuit malfunction. 	<ul style="list-style-type: none"> Check the installation ambient and environment. Check the detection circuit inside solar inverter.
HW Red ADC1 HW Red ADC2	<ul style="list-style-type: none"> Insufficient input power. Auxiliary power circuitry malfunction. Detection circuit malfunction. 	<ul style="list-style-type: none"> Check the input voltage, must > 150 V_{DC}. Check the auxiliary circuitry inside the solar inverter. Check the detection circuit inside the solar inverter.
HW ZC Fail	<ul style="list-style-type: none"> The detection circuit for synchronal signal malfunction. 	<ul style="list-style-type: none"> Check the detection circuit for synchronal signal inside the solar inverter.
RCMU Fail	<ul style="list-style-type: none"> RCMU is disconnected. Detection circuit malfunction. 	<ul style="list-style-type: none"> Check the RCMU connection inside solar inverter. Check the detection circuit inside solar inverter.
Relay Test Open	<ul style="list-style-type: none"> One or more relays are abnormal. The driver circuit for the relay malfunction. The detection accuracy is not correct for V_{grid} and V_{out}. 	<ul style="list-style-type: none"> Replace the defective relay(s). Check the driver circuit inside solar inverter. Check the V_{grid} and V_{out} voltage detection accuracy.
Relay Test Short	<ul style="list-style-type: none"> One or more relays are sticking. The driver circuit for the relay malfunction. 	<ul style="list-style-type: none"> Replace the defective relay(s). Check the driver circuit inside solar inverter.
Temperature High	<ul style="list-style-type: none"> The ambient is > 60 °C (the installation is abnormal). Detection circuit malfunction. 	<ul style="list-style-type: none"> Check the installation ambient and environment. Check the detection circuit inside solar inverter.
Temperature Low	<ul style="list-style-type: none"> Ambient temperature is < -30 °C. Detection circuit malfunction. 	<ul style="list-style-type: none"> Check the installation ambient and environment. Check the detection circuit inside solar inverter.

11. Maintenance

DANGER



Risk of death by electrocution

Potentially fatal voltage is applied to the solar inverter during operation. This potentially fatal voltage is still present for 10 seconds after all power sources have been disconnected.

- ▶ Never open the solar inverter.
- ▶ Always disconnect the solar inverter from power before installation, open the AC/DC isolating switch and make sure neither can be accidentally reconnected.
- ▶ Wait at least 10 seconds until the capacitors have discharged.

WARNING



High electrocution

When you remove the cover from the fuse section, protection degree is no longer IP65.

- ▶ Remove the cover only when it is really necessary.
- ▶ Do not remove the cover when it is raining and the inverter is wet.
- ▶ Close the cover tightly after work.

In order to ensure the normal operation of the solar inverter, please check it regularly at least once every 6 months. Check that all the terminals, screws, cables are securely in place. If there are any damaged parts, please contact a qualified technician to repair it or to replace it with a new spare part. To ensure that no foreign contaminants enter the warm air outlets, please have them cleaned every 6 months by qualified technicians.

11.1 Regular maintenance

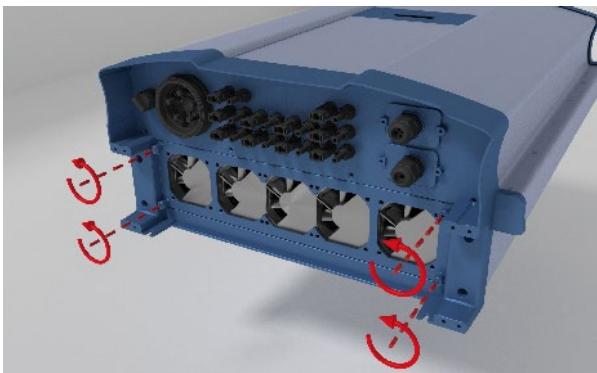
Every 6 months the following checkings should be done.

- Check string fuses. Measure the current by using a current transducer.
- Check fans.
- Check air filters.

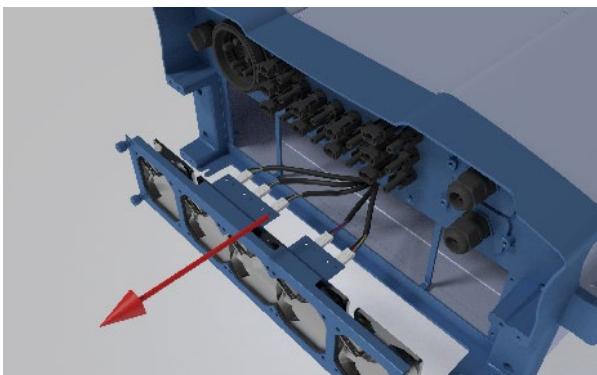
11 Maintenance

11.2 Replacing the fans

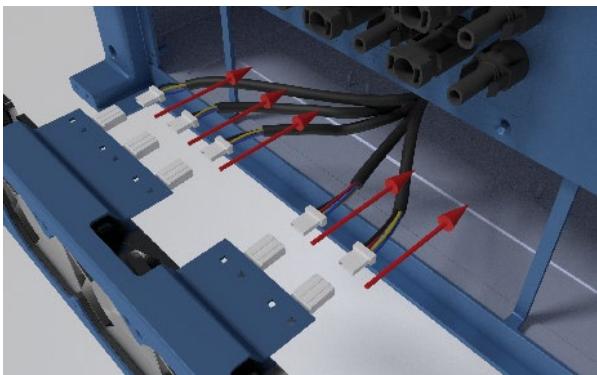
1. Loosen the 4 screws of the fan section.



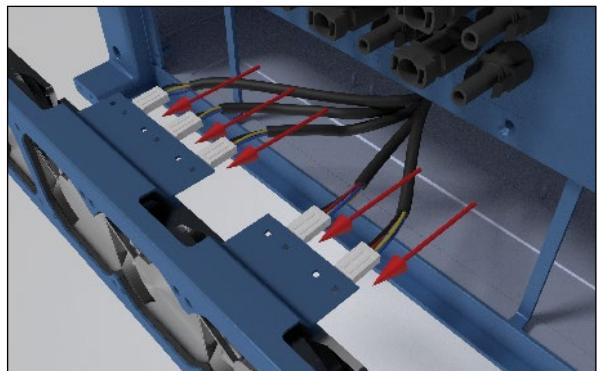
2. Pull out the fan section.



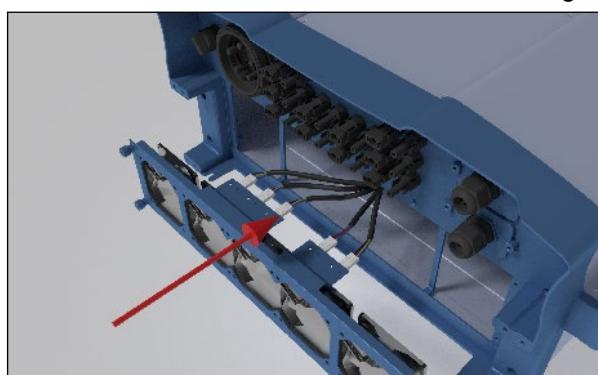
3. Pull out the five connectors with the wires.



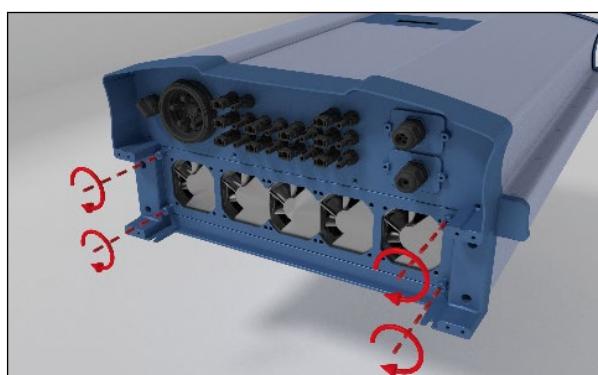
4. Plug the five connectors with the wires into the fan section. The order of the connectors does not matter.



5. Put the new fan section into the inverter housing.



6. Fasten the 4 screws of the fan section.



11.3 Cleaning the fans

⚠ CAUTION

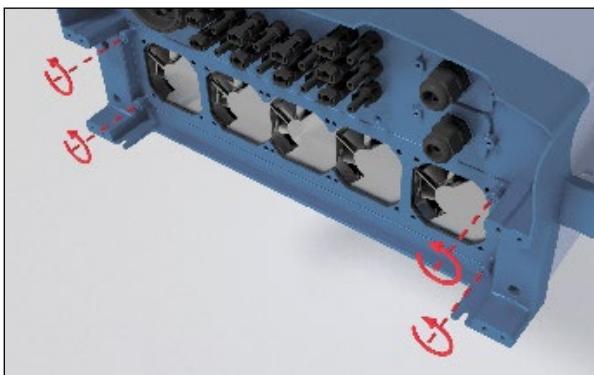


Crushing hazard

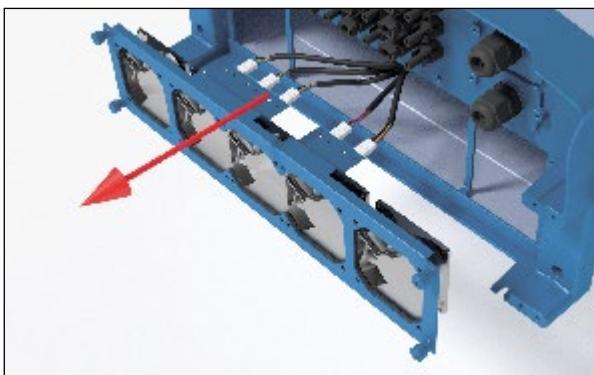
The fans contain moving parts, on which you can hurt your fingers.

- ▶ Never use your fingers to remove debris from the fans.
- ▶ Never use sharp tools as these can damage the fans.
- ▶ Use an air blower that blows dry air to clean the fans.

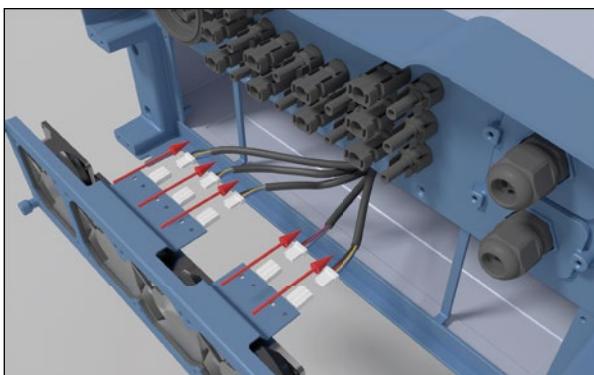
1. Loosen the 4 screws of the fan section.



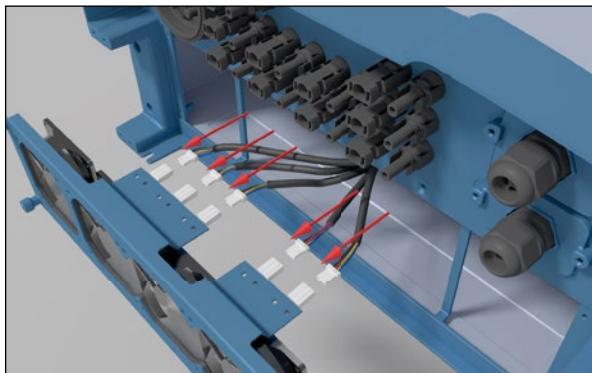
2. Pull out the fan section.



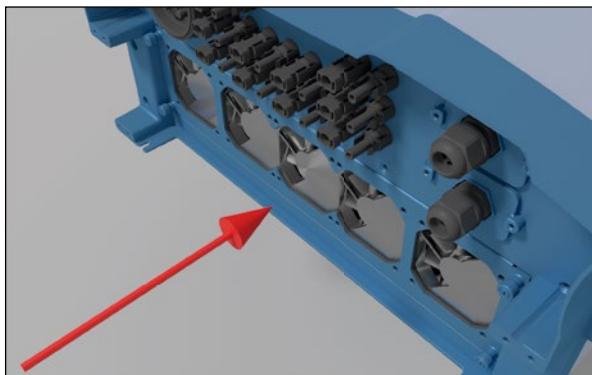
3. Pull out the five connectors with the wires.



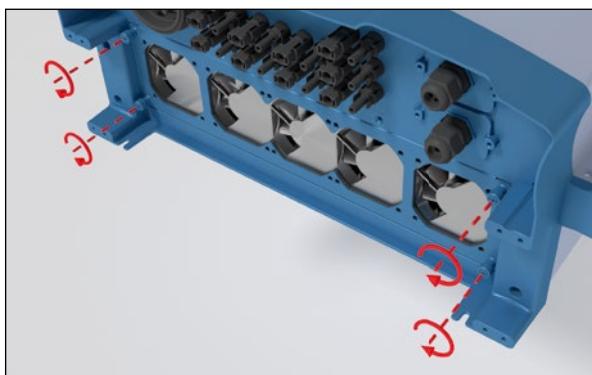
4. Plug the five connectors with the wires into the fan section. The order of the connectors does not matter.



5. Put the fan section into the inverter housing.



6. Fasten the 4 screws of the fan section.



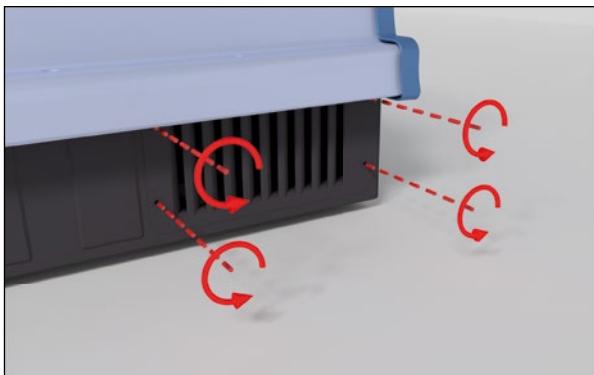
11 Maintenance

11.4 Cleaning the air filters

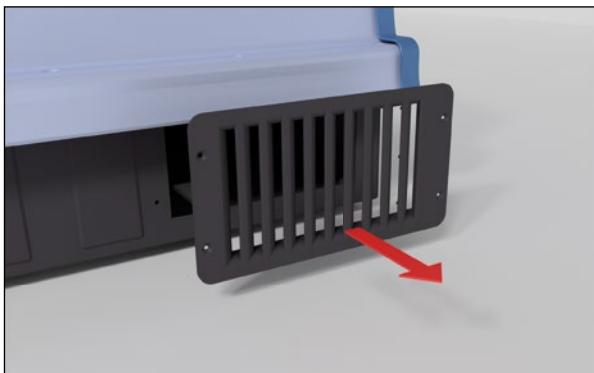
! The screws of the filter section are very small and can easily fall down. You should use a magnetic screw driver.

The inverter has two air filters, one on the upper left side and one on the upper right side.

1. Remove the 4 screws from each filter section.

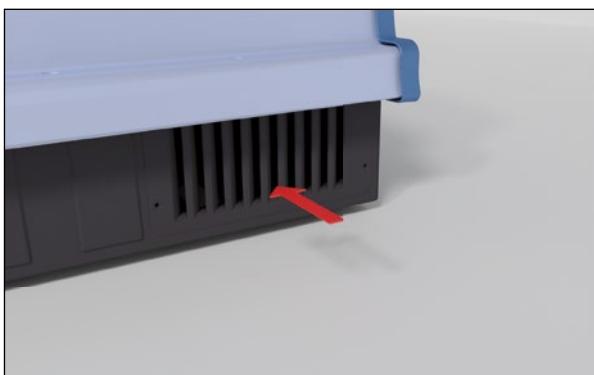


2. Pull out the air filter section.

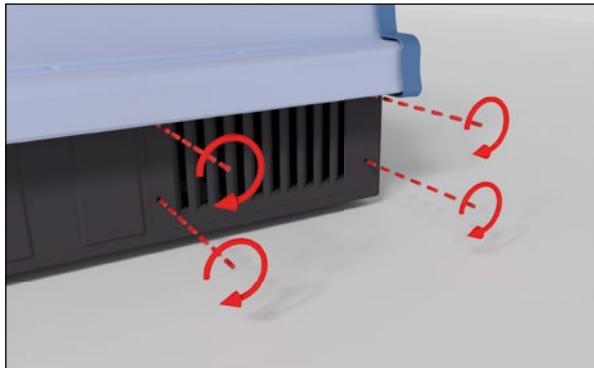


3. Clean the air filter with an air blower or a cloth.

4. Put the air filter section into the inverter housing.



5. Fasten each air filter section with the four screws.



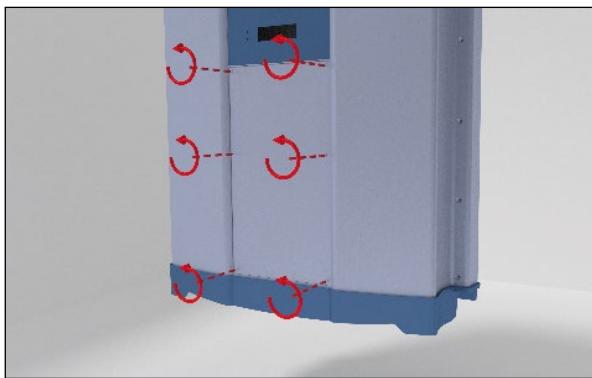
11.5 Replacing surge protection devices (SPD) on the DC side

- !** Use only the SPDs mentioned in the table below for replacement.
Delta reserves the right to deny warranty if another SPD type was used and this caused trouble on the inverter or the installation.

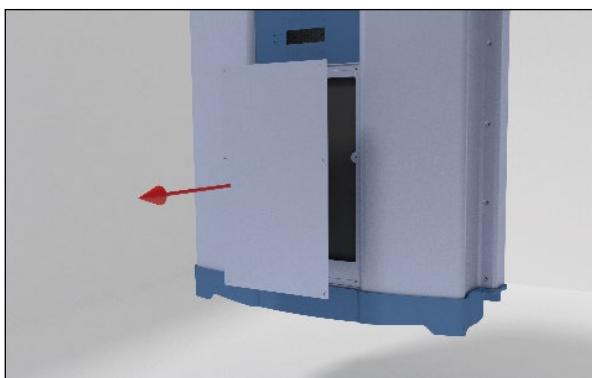
Type

Manufacturer	GEHE
Part number	GPU1-ZS1000*
Voltage U_c	1120 V _{DC}
Current I_n	20 kA (8/20)
Current I_{max}	40 kA (8/20)
Voltage U_p	≤ 3.9 kV

1. Loosen the six screws of the fuse section cover.



2. Remove the cover from fuse section.



3. Look for the SPDs that have tripped and need to be replaced.

On a defective SPD (DC) the green field is no longer visible.

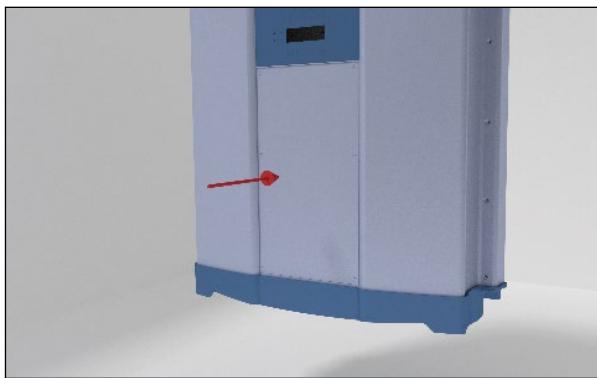


4. Pull out the defective SPD.

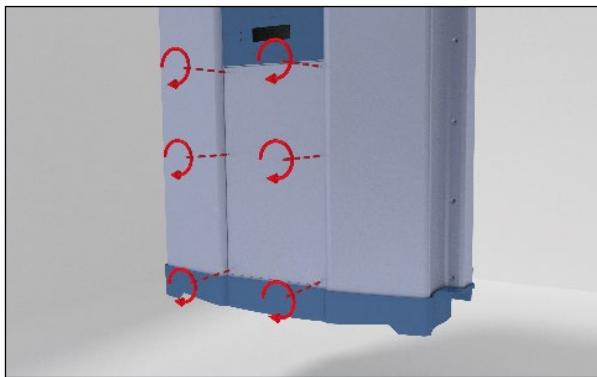


11 Maintenance

5. Plug in the new SPD.
6. Put the fuse section cover tightly on the inverter housing. Take care that the cover is correctly positioned and seals the fuse section to ensure protection degree IP65.



7. Fasten the six screws to the fuse section cover.



11.6 Replacing surge protection devices (SPD) on the AC side



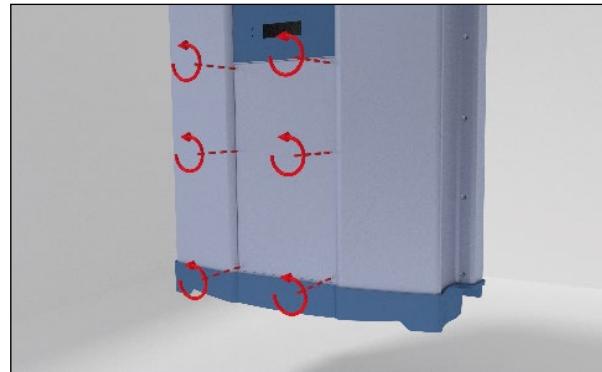
Use only the SPDs mentioned in the table below for replacement.

Delta reserves the right to deny warranty if another SPD type was used and this caused trouble on the inverter or the installation.

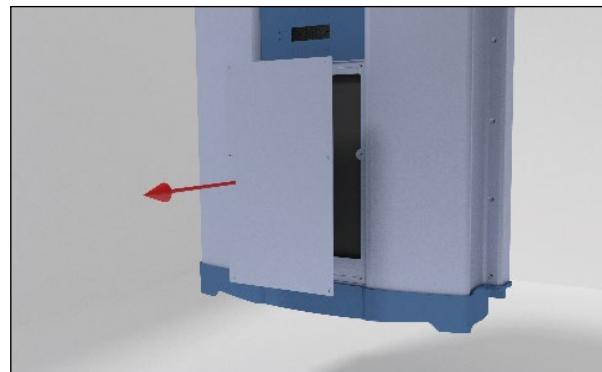
Type

Manufacturer	GEHE
Part number	GPU1-C40/690
Voltage U_C	690 V _{AC}
Current I_n	15 kA (8/20)
Current I_{max}	30 kA (8/20)
Voltage U_P	≤ 2.5 kV

1. Loosen the six screws of the fuse section cover.



2. Remove the cover from fuse section.

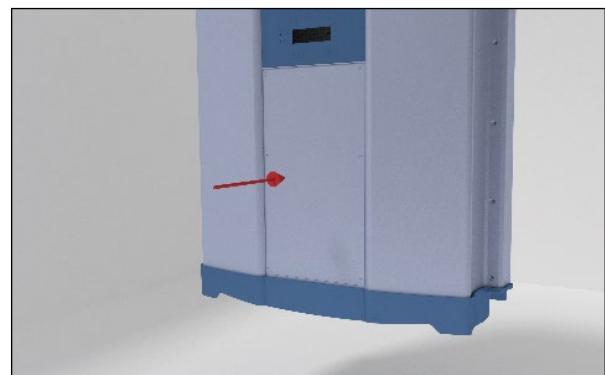


3. Look for the SPDs that have tripped and need to be replaced.

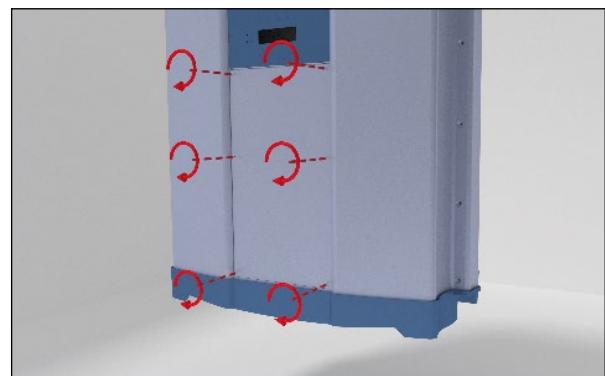
On a defective SPD (AC) the red pin has jumped out.



5. Put in the new SPD.
6. Put the fuse section cover tightly on the inverter housing. Take care that the cover is correctly positioned and seals the fuse section to ensure protection degree IP65.



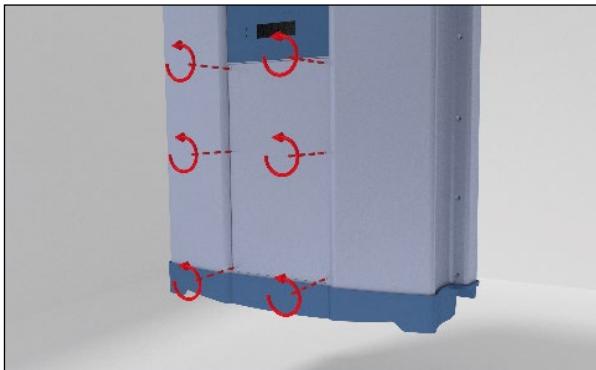
7. Fasten the six screws to the fuse section cover.



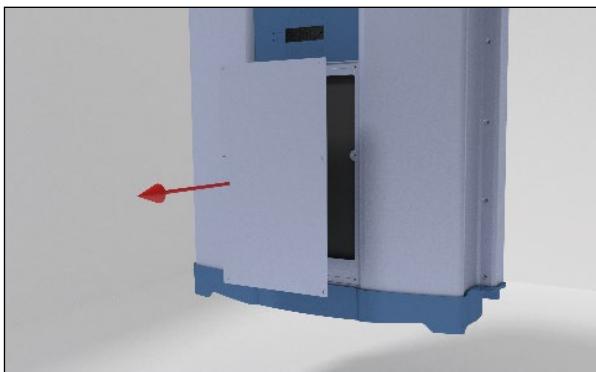
11 Maintenance

11.7 Replacing string fuses

1. Loosen the six screws of the fuse section cover.



2. Remove the cover from fuse section.



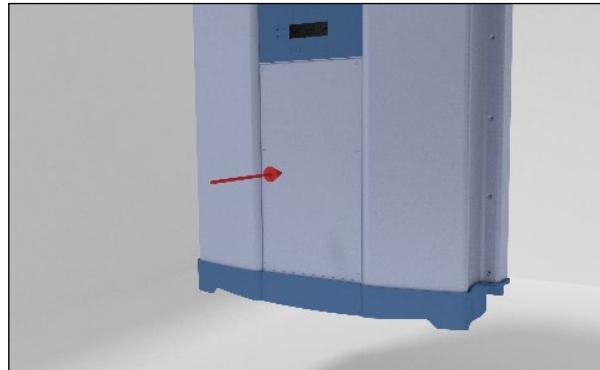
3. Use a current transformer to find the defective fuse.

4. Pull out the defective fuse.

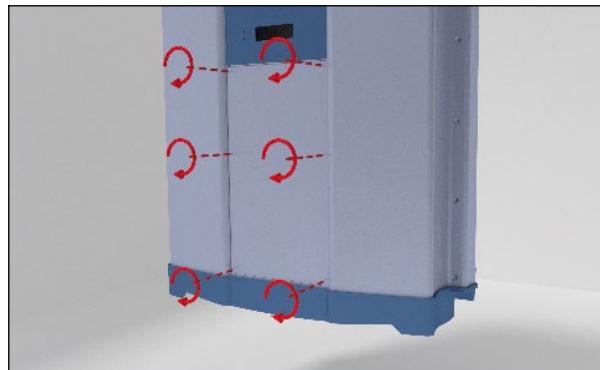


5. Put in the new string fuse.

6. Put the fuse section cover tightly on the inverter housing. Take care that the cover is correctly positioned and seals the fuse section to ensure protection degree IP65.



7. Fasten the six screws to the fuse section cover.



12. Decommissioning

DANGER



High electrocution

Potentially fatal voltage is applied to the solar inverter during operation. This potentially fatal voltage is still present for 10 seconds after all power sources have been disconnected.

- ▶ Always disconnect the inverter from power before installation, open the AC/DC isolating switch and make sure neither can be accidentally reconnected.
- ▶ Only the cover from the fuse section may be removed. Never open other parts of the inverter.
- ▶ Wait at least 10 seconds until the capacitors have discharged.

DANGER



High electrocution

Potentially fatal voltage may be applied to the DC connections of the solar inverter. When light is falling on solar modules, they immediately start producing energy. They do so, even when the sun is not shining.

- ▶ Never disconnect the solar modules when the solar inverter is powered.
- ▶ First switch off the grid connection so that the solar inverter cannot feed energy into the grid.
- ▶ Turn the AC/DC isolating switch to position **OFF**.
- ▶ Make sure the DC connections cannot be accidentally touched.

WARNING



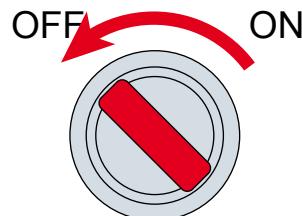
Heavy weight

The inverter weighs about 73 kg.

- ▶ The inverter must be lifted and carried by at least three people or with an appropriate lifting equipment.
- ▶ Always use the mounting plate delivered with the inverter.

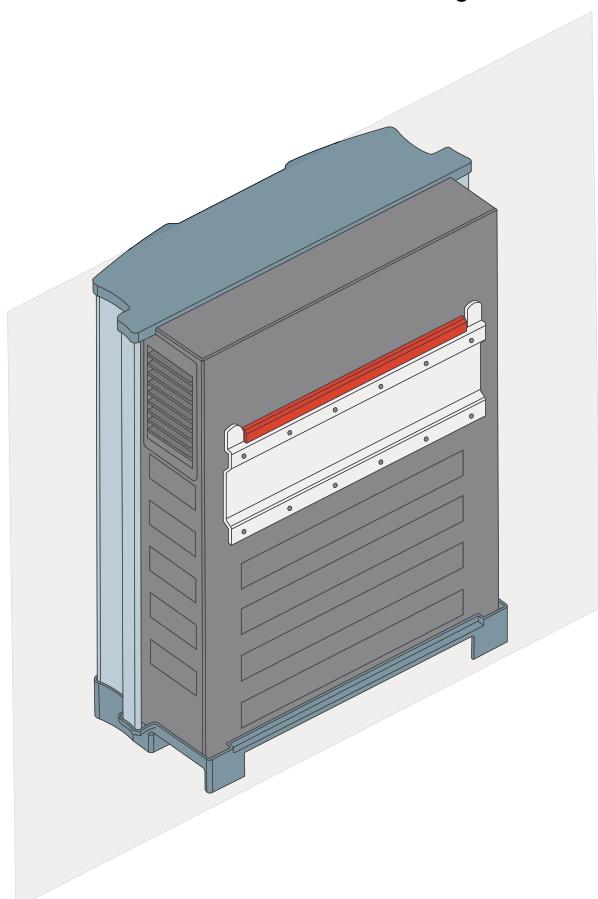
To put the inverter out of operation, e.g. for maintenance or to send it for repair, follow the instructions below:

1. Switch off the AC circuit breaker.
2. Switch off the AC/DC disconnection switch on the inverter.

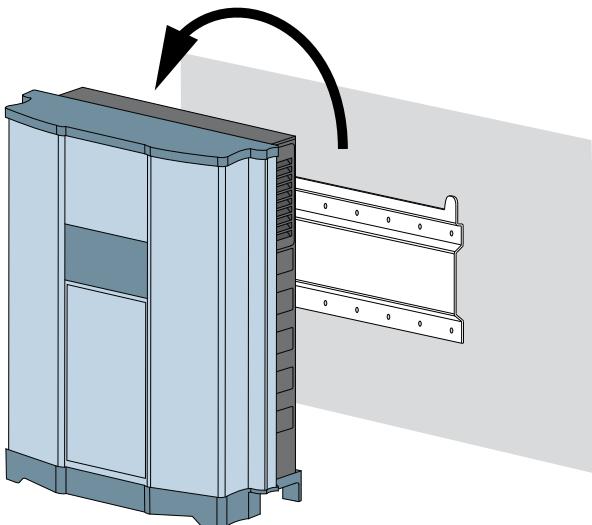


DISCONN AC/DC

3. Use a proper voltage meter to confirm that the AC and DC power connections are de-energized.
4. Pull out the AC plug.
5. Pull out the DC plugs.
6. If installed, disconnect the cables from the communication port.
7. Remove the inverter from the mounting bracket.



12. Decommissioning



8. Put the solar inverter into the original box.
9. When you store the solar inverter, consider the ambient conditions for storing, see "[13. Technical data](#)", p. 105.

13. Technical data

Input (DC)	RPI M50A_120	RPI M50A_122
Maximum recommended PV power	70 kW _P ¹⁾	
Maximum input power	58 kW	
Nominal power	52 kW ²⁾	
Voltage range	200 ... 1100 V _{DC} ³⁾	
MPP operating voltage range	200 ... 1000 V _{DC}	
Maximum input voltage	1000 V _{DC}	
Nominal voltage	600 V _{DC}	
Startup voltage	250 V _{DC}	
Startup power	40 W	
Voltage range for maximum power	520 ... 800 V _{DC} symmetrical load (50/50 %)	
Maximum input current; total (DC1 / DC2)	100 A (50 A / 50 A)	
Maximum current per input	10 A	
Maximum short circuit current in case of a failure	60 A (12 A per string)	
Number of MPP trackers	Parallel inputs: 1 MPP tracker; Separate inputs: 2 MPP trackers	
Input load	≤ 34.8 kW per MPPT, symmetrical and asymmetrical	
Number of DC inputs; total (DC1 / DC 2)	10 (5 / 5)	
Galvanic isolation	No	
Oversupply category ⁴⁾	II	
String Fuse Protection	15 A ⁵⁾	
Surge Protection Devices	Type 2	none
Output (AC)	RPI M50A_120	RPI M50A_122
Maximum apparent power ^{6) 7)}	55 kVA	
Nominal apparent power ⁶⁾	50 kVA	
Nominal voltage ⁸⁾	230 V _{AC} ± 20 % / 400 V _{AC} ± 20 %; 3 phase + PE or 3 phase + N + PE	
Nominal current	73 A	
Maximum current	80 A	
Inrush current	200 A / 100 µs	
Nominal frequency	50 / 60 Hz	
Frequency range ⁸⁾	45 ... 65 Hz	
Power factor adjustable	0.8 cap ... 0.8 ind	
Total harmonic distortion	<3%	
DC Current injection	<0.5% rated current	
Night-time loss	<2.5 W	
Oversupply category ⁴⁾	III	
Surge Protection Devices	Type 2	none

13. Technical data

Mechanical Design	RPI M50A_120	RPI M50A_122
Dimensions (W x H x D)	612 x 740 x 278 mm	
Weight	74 kg	
Cooling	5 Fans	
AC Connector type	China Aviation Optical-Electrical Technology Co. PVE5T125KE36	
DC Connector type	Multi-Contact MC4	
Communication interfaces	2 x RS485, 2 x Dry contacts, 1 x EPO, 6 x Digital inputs	
General Specification	RPI M50A_120	RPI M50A_122
Delta model name	RPI M50A_120	RPI M50A_122
Delta part number	RPI503FA0E0000	RPI503FA0E0200
Maximum efficiency	98.6%	
EU efficiency	98.4%	
Operating temperature range	-25 ... +60 °C	
Operating temperature range without derating	-25 ... +40 °C	
Storage temperature range	-25 ... +60 °C	
Relative humidity	0 ... 100%, non-condensing	
Maximum operating altitude	2000 m above sea level	
Standards and Directives	RPI M50A_120	RPI M50A_122
Protection degree	IP65	
Safety class	I	
Pollution degree	II	
Overload behavior	Current limitation; power limitation	
Safety	IEC 62109-1 / -2, CE compliance	
EMC	EN 61000-6-2, EN 61000-6-3	
Immunity	IEC 61000-4-2 / -3 / -4 / -5 / -6 / -8	
Harmonics	EN 61000-3-2	
Variations and flicker	EN 61000-3-3	
Grid interfaces	You can find the up-to-date list on www.solar-inverter.com .	

¹⁾ When operated with asymmetrical load (67/33 %)

²⁾ Maximum 34.8 kW per DC input with asymmetrical load (67/33 %)

³⁾ For some firmware versions limited to 1000 V

⁴⁾ IEC 60664-1, IEC 62109-1

⁵⁾ The value when the internal temperature of the inverter is 25 °C. At higher internal temperature the value may drop to 10 A.

⁶⁾ For cos phi = 1 (VA = W)

⁷⁾ 55 kVA is possible with: DC input voltage is 600 V; symmetrical load; ambient temperature < 34 °C.

⁸⁾ AC voltage and frequency range will be programmed according to the individual country requirements.

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